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Vol. XVI, No. 7
January, 1960

# INDUSTRIAL QUALITY CONTROL

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**Inventory Policy by Control Chart**

**Sampling Plans**
**A Statistical Aid to Visual Inspection**

**Quality Control Engineering in New Designs**

QUALITY through Scientific Methods

JOURNAL OF THE AMERICAN SOCIETY FOR QUALITY CONTROL

# SHIP WITHOUT AN OCEAN

How do you lay a cable on the ocean floor—a cable that is connected to scores of large, heavy amplifiers? How do you "overboard" such a system in a continuous operation, without once halting the cable ship?

Bell Telephone Laboratories engineers must answer these questions in order to lay a new deep-sea telephone system designed to carry many more simultaneous conversations. They're experimenting on dry land because it is easier and more economical than on a ship. Ideas that couldn't even be attempted at sea are safely tested and evaluated.

In one experiment, they use a mock-up of the storage tank area of a cable ship (above). Here, they learn how amplifiers (see photo right), too rigid and heavy to be stored with the cable coils *below* decks, must be positioned *on* deck for trouble-free handling and overboarding.

Elsewhere in the Laboratories, engineers learn how best to grip the cable and control its speed, what happens as the cable with its amplifiers falls through the sea, and how fast it must be payed out to snugly fit the ocean floor. Oceanographic studies reveal the hills and valleys which will be encountered. Studies with naval architects show how the findings can be best put to work in actual cable ships.

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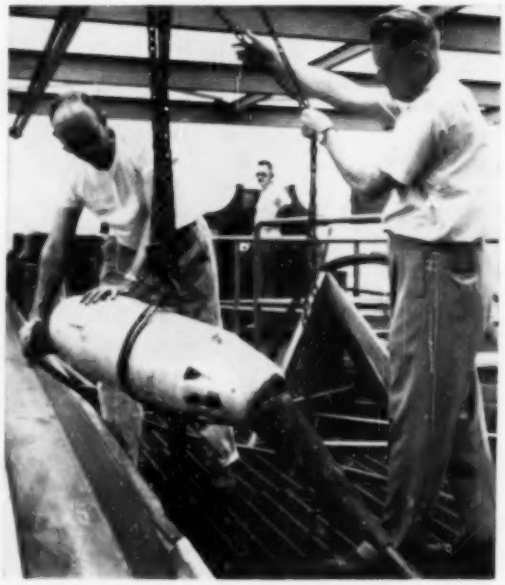

Experimental amplifier about to be "launched" from "cable ship." Like a giant string of beads, amplifiers and connecting cable must be overboarded without stopping the ship.

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10 **Quality Control Engineering In New Designs**

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The quality engineer must be able to contribute a big share of his work before the design of the product is completed or before the process is established by which it will be made. This involves pre-production quality evaluation and product and process quality planning. A teamwork relationship between the product design engineer, the manufacturing engineer and the quality control engineer is necessary to establish a compatible relationship between product and process.


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### The Inventory—Production—Sales Relation

The economic advantages of adequate inventory control in relation to sales and production at a manufacturing plant are not only important in the continual struggle against competition, but also reasonably self-evident to most plant managers.

The average plant manager fully appreciates the value of effective inventory control and usually believes that he has an active, accurate and effective policy for defining and controlling production and inventory in relation to sales. However, when he is asked to objectively define his policy, or to critically examine the dollar results of his policy to see whether it has accomplished the desired and defined ends, the existing policy may prove to be a rule of thumb, or worse, a rule of many thumbs.

### The In-Pro-Sales Control Chart

Variations in the foregoing factors may result in several policies of inventory control, ranging from simple rules to highly elaborate formulas requiring computers to handle hundreds or thousands of separate items. In the writer's opinion, there is a broad middle ground where a simple control chart technique with low clerical work load can handle the inventory problem on generally similar and homogeneous items with economical effectiveness. This technique is easily adaptable to computers on a large scale, if required.

It is not within the scope of this discussion to describe the fundamental basis and mathematical background for statistical control charts. Most companies have been using these charts in many applications for many years.

# Inventory Policy by Control Chart

J. W. DUDLEY

*American Viscose Corporation, Marcus Hook, Pa.*

In fact, he may be fortunate if any reproducible policy can be discovered in a group of related products.

### Factors Affecting Choice of Control Methods

When we try to determine what is adequate inventory control in a particular plant for a particular type of product, we find that many factors affect our selection of an inventory control policy and procedure. Some of these are:

a) The number of different grades, types or catalogued items produced. A mail order house with thousands of items probably has several inventory policies, each applying to similar or homogeneous groups of items.

b) The approximate demand rate or sales of each item.

c) The relation between clerical costs and the sales price of items in inventory. Consider the diversity in handling paper clips, jewelry, and perishable foods.

d) The cost of holding items in stock.

e) The reliability in predicting future sales, changes in design or production methods, etc. Many items depend on the vagaries of weather, styles, fads, and the like.

f) Customer relationships.

One of the most important provisions in setting up such a chart is that the subgroups which are used for computing expected variation and control limits shall consist of items which are considered to be similar, or as the statistician says, homogeneous. We believe that most plant managers, even those to whom control charts are relatively new, will not attempt to impose similar inventory policies on items of material which are fundamentally different in handling costs, volume required for storage, etc. Obviously, judgment must be exercised in deciding how broad the coverage should be in this application of control charts. We believe that a similar type of judgment would have to be exercised for any method of inventory control.

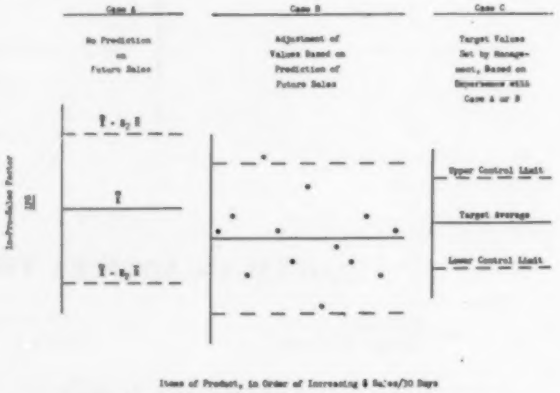
Case A
No Prediction on Future Sales
Case B
Adjustment of Values Based on Prediction of Future Sales
Case C
Target Values Set by Management, Based on Experience with Case A or B
Upper Control Limit
Target Average
Lower Control Limit
Items of Product, in Order of Increasing $ Sales/30 Days

Figure 1—Stages in Development of Inventory Control

ASQC LCS Code 340:10:000

THIS CONTROL CHART METHOD IS DESCRIBED FOR:

CASE A. WHERE FUTURE SALES CANNOT BE PREDICTED, BALANCING THE PRODUCTION OF SIMILAR ITEMS

CASE B. SIMILAR ITEMS, WHERE TOTAL SALES CAN BE PREDICTED WITH FAIR ACCURACY

CASE C. WHERE TOP MANAGEMENT HAS A WELL-DEFINED POLICY BASED ON ECONOMIC LOT SIZES AND PAST EXPERIENCE FOR PROPORTIONING INVENTORY, PRODUCTION, AND SALES

### *Steps in Control*

In this article, this control chart method is described for the following situations, as illustrated in Figure 1.

**Case A**

The case where future sales of product cannot be firmly and accurately predicted and where it may be desired to balance the production of several items considered to be similar, statistically homogeneous, and made from common raw materials or using common machines.

**Case B**

The case of similar items where total sales can be predicted with fair accuracy.

**Case C**

A case similar to Case B, in which top management has a well-defined policy based on economic lot sizes and past experience for proportioning inventory, production, and sales.

The study of economic lot sizes for the producer or the consumer has been discussed in many previous papers and textbooks.* The control chart method described here is useful, regardless of whether it is or is not desirable to attempt calculations of economic lot size.

In applying this control chart method and deciding whether to use Case A, B, or C, it is quite possible that the user might make an error in judgment as to which case is most suitable for the problem at hand, or he may attempt to include non-similar items on a single chart. For example, he may think that his inventory policy is so well established that he can proceed immediately to Case C. If he is too optimistic in this assumption, the completed chart will probably correct him in short order. Also, in a case of improper selection of non-similar items, the chart will tend to be self-correcting.

### *Control Chart Development*

In developing a control chart technique for co-ordinating inventory, production and sales, it is desirable to use dollar values which are combined into a single factor for chart study. This combined factor may be called the In-Pro-Sales factor, abbreviated as *IPS*.

For the purpose of our discussion, it will be assumed that the proposed chart will be based on some convenient fixed operating interval, such as a calendar month, and that production and sales rates will then be corrected to a 30-day basis. The following data are required to compute a value for *IPS*:

*See, for example, Hoehing, W. F., "Statistical Inventory Control," *Industrial Quality Control*, Vol. XIII, No. 7, Jan. 1957, p. 7-13.

I = $ value of inventory physically on hand at end of previous monthly interval

S = $ value of sales during previous monthly interval, prorated to 30 day basis

P = $ value per 30 days, gross sales value of production, based on rate of production at *end* of previous monthly interval

O = $ value of outstanding orders *not* shipped at end of previous monthly interval

Using the above information, the *IPS* factor is defined as:

$$IPS = \frac{I - O + P}{S + 1}$$

It should be noted that the value of unity is added in the denominator to cover the situation when monthly sales are zero. When sales are zero, it is still desirable to have a definite value of *IPS* for the particular item, because *if production is not stopped, IPS* may be still larger the following month, indicating neglect of the control chart warning.

### *Procedure for Case A*

In Case A, where future sales cannot be firmly predicted, the procedure for preparing the control chart is as follows:

Step 1: Tabulate (I − O), P and S for the items to be controlled.

Step 2: Calculate IPS for each item.

Step 3: Retabulate the items in the order of increasing values of sales, S.

Step 4: Using a suitable subgroup size, calculate upper and lower control limits for *individual IPS* values using the grand average ($\overline{\overline{X}}$) of *IPS* and the average Range ($\overline{R}$) of subgroups with standard control chart formulas for "No Standard Given":

$$UCL = \overline{\overline{X}} + E_2\overline{R} = \overline{\overline{X}} + 2.66\overline{R}$$

$$LCL = \overline{\overline{X}} - E_2\overline{R} = \overline{\overline{X}} - 2.66\overline{R}$$

with subgroups of two.

Step 5: Plot the control chart using the results of steps 2 and 4.

The control limits are always calculated for *individual values* of *IPS*, using the following values of $E_2$, taken from *Manual on Quality Control of Materials*, American Society for Testing Materials, 1951.

| Subgroup Size n | Factor for Individuals $E_2$ |
|---|---|
| 2 | 2.660 |
| 3 | 1.772 |
| 4 | 1.457 |
| 5 | 1.290 |
| 6 | 1.184 |
| 7 | 1.109 |
| 8 | 1.054 |
| 9 | 1.010 |
| 10 | 0.975 |

Whenever a value of *IPS* falls above the upper limit, inventory and/or production is too high in relation to sales, and adjustments should be made accordingly. Similarly, the converse is true for items where *IPS* falls below the lower control limit.

It will be noted that *when there are no sales during a given period*, the value of *IPS* usually becomes relatively very high. Such values of *IPS* should not be included in computing averages, ranges and limits for the control chart. Usually, those values will be found to be far above the upper control limit when the chart is completed. Nevertheless, these extra-high values act as a valuable red flag to the user of the chart, and should therefore be identified each time they occur, if there is any hope of future sales on the item. The value of *IPS* in such cases becomes the dollar value of non-moving inventory on a very unprofitable item! Naturally, the chart says they don't conform to good inventory policy.

Since Case A is not dependent on a prediction of future sales, management will normally strive to establish a target or desirable average value for the *IPS* factor. A new chart and new limits are computed each month. Gradual production changes based on a study of *IPS* values falling outside of limits will tend to reduce the width of the control chart limits so that the entire group of similar items approaches a balanced and controlled inventory condition, thereby approaching the management policy goal. When this has been attained, management can then decide whether the average *IPS* value should be raised or lowered, depending on several of the factors listed at the beginning of this article. The monthly control chart will therefore be a continual guide to management in adjusting production rates to conform with desired inventory policy.

### *Procedure for Case B*

If management has been operating for some time under Case A, and finds that it may be possible to predict future sales of the group of similar items, then the value $\overline{X}$ on the control chart may be multiplied by the factor:

$$\frac{\text{Total \$ Sales during last period}}{\text{Total \$ Sales predicted for next period}}$$

since *IPS* is almost inversely proportional to sales. The control limits are then shifted accordingly, based on the predicted value for $\overline{X}$. This is considered operation under Case B, and obviously should not be continued unless reasonably accurate sales predictions can again be made for the next future time period.

### *Procedure for Case C*

After operating successfully for a time under Case B for a group of similar items, management may wish to establish a firm policy covering a standard central value for *IPS* and also standard control limits based on past experience. This would be considered Case C, which represents a very desirable goal for management. Such *standardized control values for one group of products might be considerably different from controls for another group.*

It is again emphasized that this In-Pro-Sales control chart is a flexible tool which in no way interferes with calculation of economic lot size or other well known production control methods which may already be in use at the plant. The *IPS* technique, particularly in the stage described as Case A, serves as a simple and rational check on other parts of the production control system. If management is operating either under Case B or Case C, and a radical change occurs in the overall market for the group of products, the situation should be resurveyed by again using the methods described under Case A.

**TABLE I—Example of Data for Case A**

| Item | Rank in order of sales | (I—O) $ | P $ | S $ | IPS* Value |
|---|---|---|---|---|---|
| 1 | 4 | 9070 | 8880 | 13640 | 1.32 |
| 2 | 27 | 44640 | 28770 | 39680 | 1.85 |
| 3 | 29 | 47320 | 34170 | 42300 | 1.93 |
| 4 | 8 | 43710 | 40230 | 23240 | 3.61 |
| 5 | 15 | 48340 | 32300 | 32010 | 2.52 |
| 6 | 25 | 45310 | 32590 | 36960 | 2.11 |
| 7 | 19 | 51320 | 35510 | 34050 | 2.55 |
| 8 | 3 | 16180 | 5030 | 11540 | 1.84 |
| 9 | 16 | 27760 | 40560 | 32090 | 2.13 |
| 10 | 30 | 48810 | 31620 | 47340 | 1.70 |
| 11 | 28 | 44230 | 9910 | 41620 | 1.30 |
| 12 | 2 | 9390 | 2080 | 6180 | 1.86 |
| 13 | 24 | 24130 | 30800 | 36530 | 1.50 |
| 14 | 10 | 40110 | 23810 | 25310 | 2.53 |
| 15 | 22 | 37740 | 35790 | 34680 | 2.12 |
| 16 | 11 | 48140 | 44270 | 28340 | 3.26 |
| 17 | 6 | 11890 | 8930 | 17080 | 1.22 |
| 18 | 12 | 23840 | 50310 | 29660 | 2.47 |
| 19 | 7 | 42710 | 34280 | 22020 | 3.50 |
| 20 | 21 | 42440 | 40330 | 34670 | 2.39 |
| 21 | 1 | 5490 | 1680 | 5610 | 1.28 |
| 22 | 23 | 26170 | 34780 | 36210 | 1.68 |
| 23 | 26 | 37800 | 33700 | 38740 | 1.85 |
| 24 | 5 | 40040 | 13400 | 17070 | 3.13 |
| 25 | 14 | 23350 | 25070 | 30770 | 1.57 |
| 26 | 9 | 28720 | 28490 | 23770 | 2.41 |
| 27 | 17 | 42830 | 19330 | 32380 | 1.92 |
| 28 | 20 | 20240 | 31760 | 34200 | 1.52 |
| 29 | 13 | 46310 | 41260 | 30140 | 2.91 |
| 30 | 18 | 35240 | 29570 | 33370 | 1.94 |

$$*IPS = \frac{I-O+P}{S+1}$$

**TABLE II—Example of Calculations for Case A**

| Item | Rank in order of sales | IPS | Range $R_2$ |
|---|---|---|---|
| 21 | 1 | 1.28 | |
| 12 | 2 | 1.86 | 0.58 |
| 8 | 3 | 1.84 | |
| 1 | 4 | 1.32 | 0.52 |
| 24 | 5 | 3.13 | |
| 17 | 6 | 1.22 | 1.91 |
| 19 | 7 | 3.50 | |
| 4 | 8 | 3.61 | 0.11 |
| 26 | 9 | 2.41 | |
| 14 | 10 | 2.53 | 0.12 |
| 16 | 11 | 3.26 | |
| 18 | 12 | 2.47 | 0.79 |
| 29 | 13 | 2.91 | |
| 25 | 14 | 1.57 | 1.34 |
| 5 | 15 | 2.52 | |
| 9 | 16 | 2.13 | 0.39 |
| 27 | 17 | 1.92 | |
| 30 | 18 | 1.94 | 0.02 |
| 7 | 19 | 2.55 | |
| 28 | 20 | 1.52 | 1.03 |
| 20 | 21 | 2.39 | |
| 15 | 22 | 2.12 | 0.27 |
| 22 | 23 | 1.68 | |
| 13 | 24 | 1.50 | 0.18 |
| 6 | 25 | 2.11 | |
| 23 | 26 | 1.85 | 0.26 |
| 2 | 27 | 1.85 | |
| 11 | 28 | 1.30 | 0.55 |
| 3 | 29 | 1.93 | |
| 10 | 30 | 1.70 | 0.23 |
| | Averages | 2.131 | 0.553 |
| | $\bar{E}_2\bar{R}$ | 1.471 | |

Upper Control limit, UCL 3.602
Lower Control limit, LCL 0.660

### *Example of Case A*

Let us assume that a textile producer is manufacturing 30 types of cloth (different weights, weaves, color, etc.). Following the procedure for Case A:

Step 1: The 30 items are entered in Table I, with the values of (I—O), P, and S. (Also a rank number based on S)

Step 2: *IPS* is calculated for each item and entered in Table I.

Step 3: Rearrange the items by sales rank number as shown in Table II.

Step 4: Using a subgroup of 2 for this case, compute $\overline{X}$, $\overline{R}$, and the control limits, as shown in Table II.

Step 5: Plot the chart (Fig. 2).

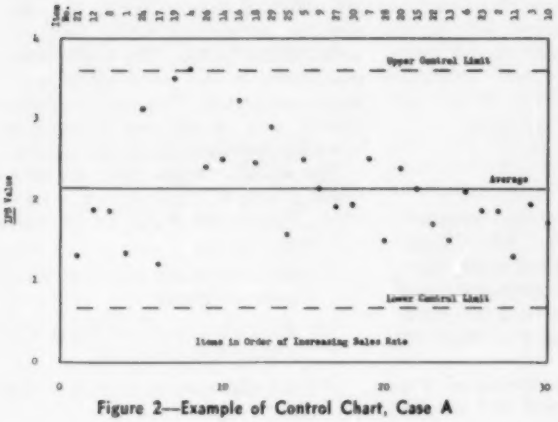


Figure 2—Example of Control Chart, Case A

When more than 60 items are involved, it may be desirable to increase the subgroup size to 3, 4, . . . 10. In accordance with control chart theory, subgroup size should not exceed about ten when ranges are used, and a subgroup size of two to five is preferable in this application.

Several conclusions may be drawn from the *IPS* control chart by the plant manager:

a) Since the average value of *IPS* in this example is 2.131, the sum of monthly production and inventory is approximately twice the average sales rate over the 30 items.

b) Since the lower control limit on the chart is less than unity, there is a possible risk of certain items running out of stock, with inventory plus production running behind sales, although no specific item had an *IPS* less than 1.00 on the chart.

c) Item 4 has an *IPS* value above the upper control limit, with items 19, 16, and 24 high enough to warrant an extra check on sales forecasts and production planning, so as to bring *IPS* values closer to the target average value desired by the manager on his next control chart.

It should again be emphasized that this control chart procedure is intended for use on individual values of *IPS* only. The use of small subgroups is in accordance with usual control chart practice to estimate the expected *variation* occurring among items having a relatively close current dollar sales rate. If certain items are not turning over rapidly, the subgroups for these items will then have internal variations of *IPS* value which will then be compared on the chart with other subgroups of items which are turning over rapidly. The plant manager may then find that one of two situations occurs on his chart:

a) Various values of *IPS* may fall outside of control limits in a random manner across the chart. Such a situation simply indicates that the production rates for these items need to be corrected if they are to be maintained in a condition of inventory control on the same policy as the other items.

b) In another situation, the manager may find that all of the items at one end of the chart are out of control with respect to those at the other end. The manager must then decide whether he wishes to maintain a consistent policy over the entire group of items, or whether he has actually tried to include high turnover items (at the right-hand end of his chart) which should actually have been charted under a separate policy. This is the situation where the chart tends to be self-correcting, so that it will tell the plant manager whether he actually has a single policy or whether he should select a breakpoint and change his inventory policy for a certain portion of the products having an exceptionally high (or low) turnover rate.

It may be noted that the chart also calls the manager's attention to the ranking of items in order of sales value, and obviously this relative ranking will change from month to month. It appears to the writer that this type of ranking for setting up the chart is the one fundamentally of greatest interest and utility to the plant manager. The subgroup size selected for setting up the chart is only for the purpose of computing upper and lower control limits for individual values, since the *averages of subgroups are not plotted.* In case a plant manager who is statistically minded, should question whether this method of grouping is in accordance with normal control chart theory, we suggest that the purpose of the chart itself is to tell him whether the values of *IPS,* so arranged, form an approximately normal universe of values. If they do not, then considerable numbers of *IPS* values will fall outside of the control limits, which indicates that the manager *does not really have a consistently successful inventory policy,* but only thinks he has, for the group of items being considered.

When the sales rate (S) of an item *approaches* zero, obviously the value of *IPS* can have relatively large positive or negative values. This property of *IPS,* together with the random fluctuations of sales, production difficulties and delivery changes, makes the *IPS* factor a suitable and effective parameter for impartial studies of inventory policy by the control chart method.

Those who are familiar with the many other applications of control charts will recognize that the values of $E_2$ given in this paper are based on estimated limits extending three standard deviations above and below the average. These limits are conservative and will only rarely give a false indication that a value of *IPS* is too far from the target or central value. If tighter limits are desired, the values of $E_2$ may be multiplied by ⅔ to cut the limit to two standard deviations. When such narrower limits are used, about 5 percent of the *IPS* values will tend to fall outside of limits by pure chance, causing the plant manager a little additional worry. When one is learning to use the charts, however, the narrower limits may promote interest and result in a more rapid improvement in overall inventory control.

# SAMPLING PLANS

# A STATISTICAL AID

# TO VISUAL INSPECTION

C. KENNETH DIVERS

*Brown-Lipe-Chapin Division, GMC, Syracuse, N. Y.*

### *Introduction*

Sampling plans, when applied to inspection done in the plant between processing operations, provide an effective means of reducing inspection costs and improving quality. When applied to visual inspection areas, they have the added advantage of reducing inspection fatigue, especially that associated with highly polished parts. As a result, better quality is passed with fewer scrap or salvage pieces.

This article will cover the application of AOQL (Average Outgoing Quality Limit) sampling plans to the control of visual quality of parts leaving our polishing department, prior to their plating. Inspection procedures followed, plans used, and advantages gained by these devices will be discussed.

### *Inspection Procedures*

Die cast parts, after polishing, are assembled by the polisher into lots of various sizes on carts especially designed for that purpose. If the part is produced on an automatic polishing machine, the unloader assembles the parts into lots. These parts are then randomly sampled by an inspector, according to an AOQL sampling plan designed for that part and lot size, and the lot is either accepted or rejected. Random sampling is assured by having the inspector use a table of random numbers to select the sample.

A rejected lot is sorted 100 percent by the polisher, the "bad" parts are repolished or scrapped, and the lot is resubmitted to the inspector for resampling.

This procedure is also used for polished steel parts.

The selection of the inspectors and the inspection standard is of utmost importance in any visual inspection scheme. It is to be remembered that the acceptability of the part is subject to human judgment. We are not gaging a part or classifying it by go, no-go gages, but are visually inspecting it. Human judgment thus plays a very important role.

The quality standards used must be carefully chosen by top level inspection personnel, preferably the chief inspector, general foreman, and foreman of the job. These standards are then prominently displayed where the inspector has ready access to them and are used as a basis for acceptance or rejection decisions.

However, the competence of the inspector, who samples and checks the parts, remains the dominating factor. This inspector must be conscientious, work with a minimum amount of supervision, and have consistency, or repeatability, of decisions. It is essential that he continue, based on the quality standard, to call a good part good and a bad part bad. To assure this, we have had the sampling inspectors rank ten carefully chosen parts in order of the degree of defectiveness. The repeatability of the inspectors' judgment has been excellent. The majority of the inspectors have worked on visual inspection assignments for a minimum of ten years. We have noted, however, in 100 percent inspection areas, that the repeatability of decisions is comparatively poor. A part of X quality will pass an inspection station in the morning and be rejected in the afternoon, or vice versa. Also in 100 percent inspection areas a gradual deterioration in quality will often not be noticed until a drastic change in quality level has taken place. We have not observed these phenomena in sampling areas.

### *Sampling Plans*

AOQL plans were chosen because it is essential that the parts leaving our polishing department, in the long run, be of quality better than or equal to the AOQL. The parts, after acceptance in the polishing department, are plated. The quality of the plated part is directly dependent upon the quality of the polished part.

The AOQL ranges that we have found practical run from 1 to 4 percent. The chosen AOQL is dependent upon

(1) the cost of the part if it were to be scrapped;

(2) the difficulty of polishing and plating the part; and

(3) the end quality desired in the part.

A typical sampling table used by the floor inspector is shown in Table I. The $p'_M$ values represent approximate incoming lot quality corresponding to the AOQL value on the AOQ curve for the plan. The effec-

**TABLE I—Sampling Table**

| Part | Sample Size | Reject Number | AOQL (%) | $p'_M$ (%) |
|---|---|---|---|---|
| A | 35 | 2 | 2.4 | 5 |
| B | 35 | 2 | 2.4 | 5 |
| C | 25 | 1 | 1.5 | 4 |
| D | 18 | 1 | 1.0 | 6 |
| E | 75 | 4 | 2.6 | 4 |

ASQC LCS Codes 221; 222:70:434

tiveness of these AOQL plans were proven when examination of inspection records after plating showed that the quality levels entering our assembly department were all better than the AOQL.

### *Advantages of Sampling Plans*

The use of sampling plans instead of 100 percent inspection has the following advantages:

1. Inspection efficiency is increased
2. The amount of inspection labor is decreased
3. The quality level increases
4. The emphasis on quality is placed upon production
5. Rework and scrap are decreased.

Increased inspection efficiency and increased quality level go hand in hand: as the inspection efficiency is increased, fewer bad parts are sent to the next process and, as a result, better quality parts with less scrap emerge from the total process. An inspector, after looking at 1000 or more parts that are highly polished, becomes fatigued and his eyes blur over defects. By reducing the number of parts that an inspector looks at, his efficiency increases and he calls fewer good parts bad and fewer bad parts good.

A decrease in the amount of inspection labor is a definite monetary savings that also comes as a direct result of the use of sampling plans. The following example will illustrate savings that we made in this area alone.

Five hundred parts per hour were being produced by four different polishing lines, each line polishing a different part. Under 100 percent inspection this required four inspectors. These parts, however, are now placed in specially designed containers in lots of 500. The sampling inspector takes a maximum of 15 minutes to sample and check the skid if it is to be accepted; less time, normally, if it is rejected. Thus, this one inspector can now judge the same volume of product that formerly required four.

Emphasis on quality is placed upon production through the use of sampling plans. In any 100 percent inspection scheme, the burden of maintaining the quality of the parts being inspected rests on the inspection department, for it is actually sorting the parts, separating the good from the bad. As a result, the producer of the part (in this case the polisher) takes little pride in the quality of his work, for he knows that if it is not acceptable it will be sent back to him. Thus, the emphasis on quality shifts from the producer to the inspector. Needless to say this is undesirable, both from the practical and economic viewpoint.

Sampling plans, however, reject the work by lots if it does not appear to meet the prescribed quality level. It is now, not inspection's job to maintain a specified quality level, but production's, as the polisher responsible for a rejected lot must re-inspect his work and bring it up to the quality level, either by replacing the bad parts with good ones or by repairing the bad ones. As a result, the production man cannot make his quota if he has many lots rejected. Thus he strives to submit lots to the sampling inspector that are of a quality which the sampling plan will accept. The emphasis on quality is therefore placed on the production department where it belongs, as quality is built into a part, not inspected in.

Rework and scrap are decreased because better quality parts come from the production department. The rework is cut down as a result of the polisher's desire to have all his work accepted. He therefore does a better job, produces fewer pieces that will result in scrap in the plating department, and produces a better quality part.

When parts are being 100 percent inspected, they are accepted by the inspection department and production flow is kept steady regardless of the quality level. However, the use of sampling plans may result in an interruption in this production flow. This condition will occur when the average quality level submitted to inspection is poorer than the AOQL. Thus, a poor quality level is forcibly brought to management's attention, and either the cause of the poor quality will be eliminated, or 100 percent inspection must be returned to the job, at greater cost.

At Brown-Lipe-Chapin Division, GMC appropriately chosen AOQL sampling plans, when applied to parts leaving our polishing department, have cut in half our scrap and rework due to poor polishing; they have reduced the inspection labor in these areas by three-fourths; production has realized that the responsibility for quality is theirs, and consequently a better quality product has resulted.

## *Third Automotive Division Conference*

**The Third National Automotive Division Conference will be held Thursday, Feb. 11, at the Rackham Memorial Bldg., Detroit, Mich.**

**Major aspects of establishing and maintaining a quality control program in automotive and supporting industries will be discussed by the most experienced speakers in this field.**

**Topics and speakers are:**

**Application of Evolution Operational Procedures to Resistance Welding of Automotive Sheet Metal—M. Thomas, American Welding Society member, instructor at General Motors Institute. Gordon Webster, GMI member, will collaborate on this subject.**

**Basic Elements of Good Forms Design Practice as Applied to the Gathering of Quality Control Information—Irving Hasselo, vice president of Frank M. Knox Co., business consultants, and National Office Management Association member.**

**The Statistical Evaluation of Surface Finishing on Automotive Sheet Metal—Richard Bingham, QC manager, Coated Abrasive Division, The Carborundum Co., Niagara Falls, N. Y.**

**Major Capabilities—David M. Smith, manager of research, Jones & Lamson Machine Co.**

**The Human Relations Aspect of Quality Control in the Automotive Industry—George Odiorne, School of Business Administration, University of Michigan, Ann Arbor, Mich.**

# QUALITY CONTROL ENGINEERING

### *Introduction*

In its adolescent years, Quality Control looked to its big brother, Inspection, for a start in the industrial community. In many industrial locations, Quality Control soon became dominant and inspection became a part of the quality control function. In still other locations, Quality Control never matured and at most, it became a new tag for the inspection function. In such locations, Quality Control did not make a particular contribution; it merely coordinated the quality-related work of other functions. Until such time as Quality Control matures and contributes a distinctive service, it will not be recognized as a field requiring professional capabilities.

In many Quality Control organizations where a quality engineering function was established, there was a strong temptation to have such a function handle quality problems of an emergency nature. However, this "fire-fighting" activity was one that inspection supervision had been doing for many years. Of course, some improvement might have been noted because quality control engineers could bring more time and technical knowledge to bear on problems. Yet for all the good work that might have been done in problem solving, there was still no contribution that was distinctly beyond what had already been accomplished through the inspection function.

Fortunately, in some industrial locations today, quality control engineers are doing the long-range analysis and planning necessary to *prevent* a future rash of quality problems. In order to free quality control engineers from "quality fire-fighting", it has been found necessary to turn this activity over to process control engineers or specialists who handle short-range problems. However, when a quality control engineer has responsibility for both short-range, emergency type work, mixed with a responsibility for long-range work, the short range soon squeezes out the long range.

Let us take a look at the kind of work that can be accomplished when we have the quality control engineer concentrate his efforts on *prevention* of quality problems. First, consider *when* this preventive work must be accomplished. As you might expect, it has to be done early in the product development schedule before production starts. As a matter of fact, to be truly effective, the quality control engineer must be able to contribute a big share of his work before the design of the product is completed or before the process is established by which it will be made. It is this area of New Design Control on which we shall focus in this discussion.

The quality control engineer concerns himself with two distinct major tasks. The first is *Pre-production Quality Evaluation;* the second is *Product and Process Quality Planning.* Let us discuss each of these in that order.

### *Pre-Production Evaluation*

In pre-production quality evaluation the quality control engineer is concerned with two basic elements: first, the product; and second, the process. These two elements are closely related. The design engineer has to know the process by which the various parts are going to be made before he can complete his design. Obviously, the processes will be selected on the basis of what the product design requires. A teamwork relationship between the product design engineer and the manu-

ASQC LCS Code 600:60:000

facturing engineer is necessary to establish a compatible relationship between product and process.

The quality control engineer can become an important member of this team—not because he knows more about design than the design engineer or more about processes than the manufacturing engineer. Rather, his contribution is based upon experience with quality problems that arose with previous similar devices. He has seen the product on which specific customer complaints were received. He knows the product's strengths and weaknesses under the uses and abuses encountered in the field. He can point out potential quality trouble spots where design margin is thin or where specification requirements will sorely press process capabilities.

One of the important questions that arise at this point is "Will the quality control engineer's suggestions be accepted by the design engineer?" First of all, the validity of the suggestions has much to do with their acceptance. If a suggestion can be backed by factual data from previous experience, it keeps it from being a whim. Another point is the approach. It should be helpful, not critical. The chances are good that quality control's contribution will be accepted if it is offered in a truly professional manner.

As professional quality control engineers, we do not want to subtract in the least from the product design engineer's quality responsibilities. We just want to be sure he has the needed facts and recognizes the quality problems. Then we will back him all the way. For example, if the housewife is going to use the hose on a vacuum cleaner as a handle to lift it, this had better be known, to the designer, so he can plan for it in his design. Anything that will better define end-use conditions and environments will help the design engineer to better fulfill the wants and needs of the customer.

# IN NEW DESIGNS

**W. J. MASSER** *General Electric Company*

The product design engineer has the responsibility for developing and testing the prototype, but the quality control engineer can contribute as a member of the team due to his specialized knowledge in designing and conducting tests. Experience gained in prototype testing will also prove valuable in designing factory tests to control product quality after the start of production. Review of prototype test results show relative strengths and weaknesses of the design with relation to product requirements.

For example, if drop-out voltage on a relay proved to be very close to specified requirements without much margin to spare, those characteristics contributing to variability in drop-out voltage would have to be closely controlled. That is, close control of the iron in laminated poles by a weighing process or closer control of number of turns from coil winding machines might prove to be a necessary manufacturing requirement. Such knowledge permits the quality control engineer to do a better quality control planning job which we will presently discuss in some detail.

Just as the product design engineer is responsible for the quality of his designs, the manufacturing engineer is responsible for the quality of the manufacturing processes he specifies for the product. An experienced product design engineer confers early in the design cycle with the manufacturing engineer. This is necessary, because the capability of available processes may influence the design. On the other hand, certain requirements of the design may call for development of new processes with exceptionally high capabilities.

The quality control engineer is a valuable member on this team because of the specialized contributions he can make. He has had experience in the factory in controlling all kinds of manufacturing processes—machining, heat treating, plating, finishing, assembly and many others. He knows their respective accuracies, stabilities and responses. He can furnish this information to the team. Or, in the case of a new process, he can conduct special studies that will accurately determine its capabilities and the results that occur under certain combinations of operating parameters.

The quality control engineer may be helpful in bringing the design and the process into compatible relationship. His analysis of tolerances may permit tightening down the tolerance on characteristics, where manufacturing capabilities are high, in order to gain increased tolerance where manufacturing capabilities are difficult or costly to improve. The quality control engineer must be highly skilled in analyzing tolerances to assist the design engineer

**Editorial Note**

This article by Mr. Masser is the third in the series of "Professionalism in Quality Control," articles which are being presented by *Industrial Quality Control.*

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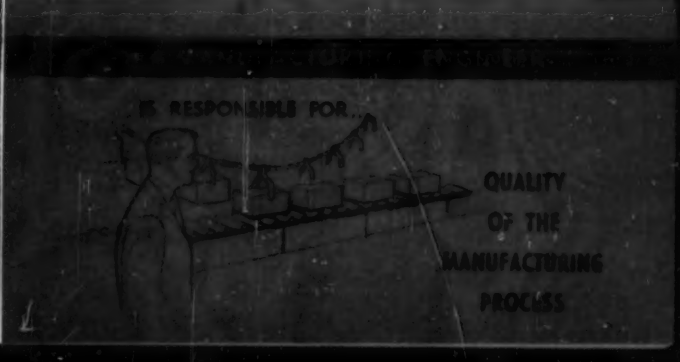


in specifying tolerance limits that are realistic and can be consistently achieved by the factory.

Another important pre-production activity of the quality control engineer is that of reviewing the product specification for completeness and clarity. In the first place, the quality characteristics that really matter in causing the product to fulfill its intended function must be specified at the proper levels. In the second place, these specifications—these quality requirements—must be clearly understood by the vendors and the manufacturing personnel. We have all seen quality problems arise simply because someone did not understand, for example, that a surface not only had to have a certain finish but also a certain degree of flatness. The design intent was not understood. This is why the quality control engineer, if he is to prevent quality problems, must see that necessary quality requirements are always clearly defined.

### *Product and Process Quality Planning*

This leads us into the second major activity of the quality control engineer—*Product and Process Quality Planning.* This is a major part of a greater planning job which calls for planning the entire quality system. The quality system is the network of administrative procedures, by which Total Quality Control is implemented. The quality system includes all the quality related activities of the business whether they occur in marketing, product engineering, or manufacturing.

Planning of the entire quality system is often delegated to the quality control engineer. Planning is simply mapping out in advance the things that have to be done and when they have to be done to insure a final result within a specific period of time. It also designates who will do each piece of the work. In the case of product and process quality planning, each step that is taken must be set down in detail to insure a product that meets quality requirements. The quality control engineer knows the minimum steps that must be taken to insure delivery of a satisfactory product to the customer. He knows how to arrange these steps to get the most delivered quality per dollar of quality cost.

In order to do this, the product will have to be analyzed piece by piece and component by component to determine which quality characteristics are essential to the final performance of the device. The professional does not waste time on non-essentials. To perform such an analysis, the quality control engineer will make a classification of all product quality characteristics, listing them in accordance with their relative importance in supporting the product function. Characteristics should be classified, for example, as critical, major, and minor for product and manufacturing process requirements. The product design engineer who designed and developed the product will be able to assist in making such a classification.

However, some characteristics that may seem minor, as far as product function is concerned, may assume major importance due to their effect on later processes which could influence major characteristics. For example, if a machined surface is used from which to reference certain critical dimensions, it may have to be exceptionally flat although the flatness itself does not enter into the function of the device. Hence, we see that some characteristics may be up-graded in classification due to their importance with relation to the manufacturing process. This means a working relationship with manufacturing engineers and process planners.

When the quality control engineer has classified the quality characteristics as to their relative importance and determines from the process sheets where each characteristic is generated, he can plan what characteristic to measure, at what points in the process the measurements should be made and the frequency with which measurements should be made. A knowledge of process capability and process stability enables the quality control engineer to take sufficient readings for process control and at the same time, avoid excessive inspection with its attendant high costs.

The number of inspection points or stations is also a consideration. Each process step offers a possible inspection or test point. Use of all of these points can seldom be justified on the basis of economics or good manufacturing practice. This means that certain characteristics will have to be measured several process steps beyond the point they are generated. Consolidation and location of inspection and test points to minimize costs becomes an interesting problem requiring a knowledge of optimization techniques.

As industry undertakes the heavy capital investment involved in mechanization and automation, location of inspection points gains even greater significance.

Mechanization and automation of inspection and test measurements, offer economies that justify their use for closer process control. The possibility of using such measurements in a closed-loop feedback for direct control of the process offer interesting possibilities and should not be overlooked. In any event, quality information must be gathered and fed back to the operator so he can keep the process adjusted to produce to established quality standards.

Good quality planning places responsibility for quality with the operator, but the operator cannot accept that responsibility if he is "flying blind." The quality control engineer provides the means for informing the operator of the quality he is producing at the time he is producing it. To this end, the quality control engineer is responsible for planning the quality information system. The flow of pertinent quality information is charted to reach those who can act upon it, using the data as a basis for corrective action. Lines of communication should be kept as short as possible. Design of quality information charts and forms should be "action-centered", indicating who is responsible for taking action. Procedures should be established that will quickly report action taken or proposed action and will follow-up to see that the action was not only taken, but that it was effective in producing the desired result. Such procedures eliminate "loose-

ends" and solidly build quality improvement for both product and process.

Another set of procedures will be needed to prevent errors resulting from improper tooling, jigs and fixtures. Such manufacturing facilities should be reviewed for their original adequacy—to see that they do not introduce needless variability that will affect critical quality characteristics. Therefore, it is important to implement a quality maintenance program for manufacturing tools, jigs and fixtures. Undoubtedly you can recall many instances where a worn fixture allowed the part being manufactured to shift, thereby causing a quality problem. If we are to prevent such troubles, periodic examination and correction of tools, jigs and fixtures must be scheduled. This important part of the quality plan is often overlooked. Special tool wear studies will provide facts on which to base preventive maintenance schedules.

Perhaps of even greater importance is the standardization, calibration and maintenance of the gages and measuring equipment. To prevent serious quality troubles in the field, confidence is needed in the accuracy of the quality measurements taken continuously for quality control and product acceptance. This calls for planning a complete quality maintenance program for gages and measuring tools. In addition, procedures need to be established for the maintenance of accurate standards for use in calibrating quality measuring equipment. Schedules need to be established for periodic checking and calibration of quality measuring equipment. However, frequency of inspection is dependent on a number of factors such as type of gage or instrument, severity of service, training of personnel using the equipment, finish and composition of material being measured, tolerance limits of characteristic being measured, etc. Logging of periodic calibration and needed maintenance for each piece of quality measuring equipment should be a part of the gage control program. This provides factual data on which to base realistic checking schedules.

Business should have a continuous measurement or index of quality going to the customer—measured against end-use standards. This calls for auditing the quality of the final product, using tests to simulate field use under the environments and time periods that will be encountered in service.

Such an index should reflect in a quantitative manner the quality the customer will experience. If it is based on meaningful tests and demerits are properly weighed, it should correlate with the complaint rate for the product thus evaluated. The quality index thus affords managers with a number that measures the composite product quality being produced.

Total quality planning, however, requires adequate personnel for its implementation. The quality control engineer should specify minimum numbers of persons, their minimum qualifications and any special training needed to implement the plan. The filling of positions is usually done by a manager, supervisor, or foreman; however, these persons need to know the personnel requirements of the quality system that have been planned.

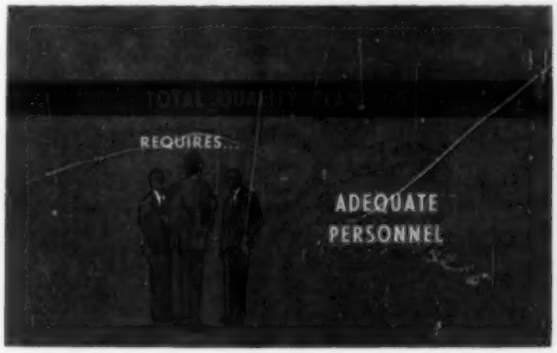
One final important task remains to be done before the quality planning job is complete. If the planning is to be useful, it must be documented in the form of specific written procedures that people can follow in carrying out the quality plan. These need to be placed in some logical sequence and clearly indexed. They must state in detail who does what, and when. Courses of action must be spelled out for various sets of circumstances that will be encountered. When all of these quality procedures are established in an orderly network and properly related one to the other, we have a quality system. A smoothly operating, effective quality system is the mark of the truly professional quality control engineer.

### *Summary*

In summary, we see that the quality control engineer has a number of specialized skills that he has acquired as a result of training and experience. These skills permit him to identify and eliminate quality problems before they become serious problems in the factory or the field. His analysis leads to establishment of a compatible relationship between product quality requirements and manufacturing capabilities.

The quality control engineer plans the quality system necessary to monitor, control, and improve the quality of the product going to the customer. Such a quality system is designed to operate with maximum economy by placing emphasis on the important quality characteristics that truly reflect the customer's need. Further economy is made possible by selective quality measurements with regard to inspection points within the process and the extent to which such measurements are made.

The quality control engineer makes an important contribution to the industrial community which results in quality products for the consumer. The extent and degree of perfection at which this service is performed will determine whether the quality control engineer will be recognized as truly professional. The quality control engineer already has made significant progress in serving the needs of business, and I'm confident that this progress will continue unabated in the years to come.



# Practical Aids

ELLIS R. OTT, *Editor*

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## Sampling Inspection Layouts

## For Two or More Classes of Defects

The purpose of this article is to outline a method that has been found useful in making up sampling inspection layouts covering the inspection of two or more classes of defects, using the Dodge-Romig AOQL sampling inspection tables.* The procedures given below for two classes of defects, termed Major and Minor, can be readily extended, by the principles outlined here, to three or more classes of defects, or may be used for two or more different groups of defects (whether of the same or different seriousness classifications), for each of which an AOQL value has been designated.

These procedures assume the usual condition that the AOQL (in percent defective) for Minors is larger than

*Dodge, H. F. and Romig, H. G., *Sampling Inspection Tables*, John Wiley and Sons, Inc., New York, 1944 (2nd edition, 1959).

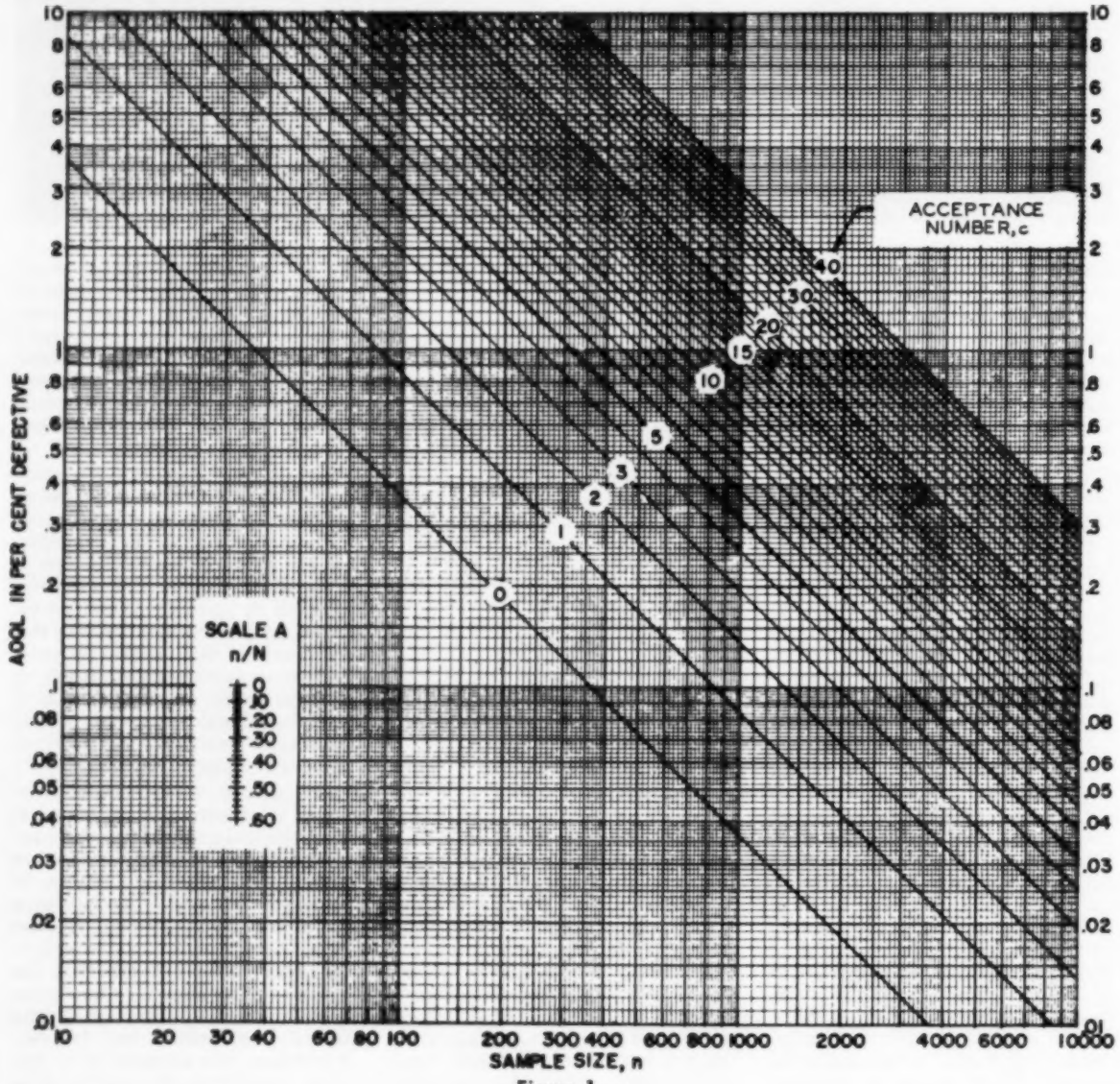


Figure 1

# Using Dodge-Romig Tables

HAROLD F. DODGE

*Rutgers • The State University, New Brunswick, N.*

the AOQL for Majors. They also assume conditions where the Poisson may be considered as a satisfactory approximation to the binomial for computing the probabilities of acceptance in sampling from a process, so that the AOQL can be computed from the formula: *

$$AOQL = y\left(\frac{1}{n} - \frac{1}{N}\right)$$

where

y = a constant
n = sample size
N = lot size

Figure 1 is a chart,* based on this formula, for finding the AOQL or sample size, n, of a single sampling plan. The curves read directly for $N = \infty$, in which case the formula is: $AOQL = y/n$. However the curves may also be used directly if n/N is very small, for then $AOQL = y/n$, approximately. The amount of correction in the value of AOQL due to the factor n/N can be seen by referring to Scale A of Fig. 1. Accordingly, when solving a problem, (1) if n/N is very small, say less than about 0.03 (but depending on the accuracy needed), read the values directly from the curves, and (2) if n/N is *not* very small, use Scale A in the manner indicated in Example 1 or Example 2.

The Dodge-Romig tables provide AOQL sampling plans that require a minimum total amount of inspection for a given value of process average percent defective in product presented for inspection. Unless otherwise indicated, the sampling plans used in the procedures below will be the ones requiring the minimum total amount of inspection, i.e., the plans corresponding to (a) the given lot size, and (b) the best available estimate of the process average percent defective, $\bar{p}$.

### Unequal Sample Sizes, Single Sampling

If it is desired to have a minimum total amount of inspection for both Majors and Minors, choose two sampling plans from the appropriate Dodge-Romig tables, each based on lot size, N, and the respective process average, $\bar{p}$. to give a minimum total amount of inspection.

*A like chart showing the relationship between sample size and AOQL based on Binomial probabilities was published in a paper by Irving B. Altman, "Relationship between Sample Size and AOQL for Attributes Single Sampling Plans," *Industrial Quality Control*, Vol. X, No. 4, Jan. 1954; Linearity was indicated in the areas covered except for small n with c = 0. The chart presented herewith based on Poisson probabilities and hence giving linear relationships throughout, was used by the author in a training text in the Bell Telephone Laboratories, Inc. in 1948 (also the same chart minus the Scale A, in an internal technical memorandum in 1942).

**Example**

Given: Majors = 1 percent AOQL, $\bar{p}$ = 0.5 percent; Minors = 4 percent AOQL, $\bar{p}$ = 1.0 percent; lot sizes = 600, 2000, 5000.

| Lot Size N | Majors* | | Minors* | |
|---|---|---|---|---|
| | n | c | n | c |
| 600 | 75 | 1 | 20 | 1 |
| 2000 | 130 | 2 | 34 | 2 |
| 5000 | 190 | 3 | 48 | 3 |

### Equal Sample Sizes, Single Sampling

If it is desired to use the same sample size for both Majors and Minors, proceed as follows:

(a) Choose the single sampling plan for Majors from the appropriate Dodge-Romig tables (based on lot size, N, and process average, $\bar{p}$) that gives a minimum total amount of inspection for Majors.

(b) For Minors, use a single sampling plan (1) with the same sample size, n, as for Majors, and (2) with the largest value of c (from Fig. 1) that gives an AOQL value not greater than the AOQL for Minors. Use Scale A of Fig. 1, as necessary, to correct for lot size (n/N factor), per Example 1.

*from Dodge-Romig tables

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(See page 29)

(c) This gives a minimum total amount of inspection for Majors, but instead of minimum inspection for Minors, substitutes the convenience of the same sample size for Minors as for Majors.

**Example**

Given: Majors = 1 percent AOQL, $\bar{p}$ = 0.5 percent; Minors = 4 percent AOQL, ($\bar{p}$ = 1.0 percent, not used); lot sizes = 600, 2000, 5000.

| Lot Size N | Majors* | | Minors† | | |
|---|---|---|---|---|---|
| | n | c | n | c | n/N |
| 600 | 75 | 1 | 75 | 5 | 0.125 |
| 2000 | 130 | 2 | 130 | 8 | 0.065 |
| 5000 | 190 | 3 | 190 | 12 | 0.038 |

## Equal Sample Sizes, Double Sampling

If it is desired to use double sampling for Majors, and to use the same sample size for both Majors and Minors, proceed as follows:

(a) Choose the double sampling plan for Majors from the Dodge-Romig tables (based on lot size, N, and process average, $\bar{p}$) that gives a minimum total amount of inspection for Majors.

(b) For Minors, use a *single sampling* plan (1) with a sample size, n, equal to the first sample size, $n_1$, of the double sampling plan for Majors, and (2) with the largest value of c (from Fig. 1) that gives an AOQL value not greater than the AOQL for Minors. Use Scale A of Fig. 1, as necessary, to correct for lot size (n/N factor), per Example 1.

(c) This gives a minimum total amount of inspection for Majors, but instead of minimum inspection for Minors, substitutes the convenience of the same sample size for Minors as for Majors (first sample).

**Example**

Given: Majors = 1 percent AOQL, p = 0.5 percent; Minors = 4 percent AOQL, ($\bar{p}$ = 1.0 percent, not used); lot sizes = 600, 2000, 5000.

| Lot Size N | Majors* | | | | Minors† | | |
|---|---|---|---|---|---|---|---|
| | $n_1$ | $c_1$ | $n_2$ | $c_2$ | n | c | n/N |
| 600 | 60 | 0 | 65 | 2 | 60 | 4 | 0.100 |
| 2000 | 80 | 0 | 165 | 4 | 80 | 5 | 0.040 |
| 5000 | 145 | 1 | 225 | 6 | 145 | 9 | 0.029 |

## General

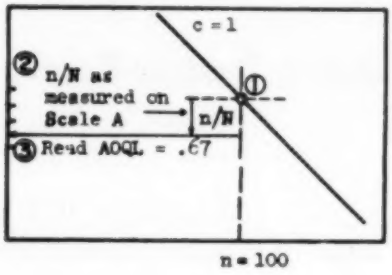
Using equal sample sizes often simplifies administration problems. However, in any particular instance, one should consider whether it may be more economical overall to give necessary training in the use of unequal samples and use a smaller sample size for Minors.

*from Dodge-Romig 1 percent AOQL double sampling table
†from Fig. 1

## How to Use the Chart (Fig. 1)

**Example 1**

Given: n = 100, N = 500, n/N = 0.20, and c = 1.

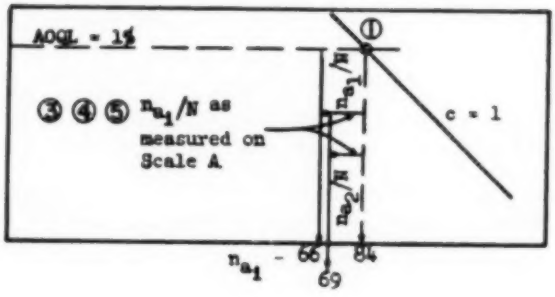



To find AOQL:

1. Find intersection of lines for n = 100, c = 1.
2. Measure down on line n = 100 the distance n/N obtained from Scale A.
3. Read corresponding AOQL value.

**Example 2**

Given: AOQL = 1%, N = 400, c = 1.




To find n:

1. Find intersection of lines for AOQL = 1% and c = 1. Read first approximation to value of n, $n_{a_1}$ = 84.
2. Compute first trial value of $n/N = \frac{n_{a_1}}{N} = .21$.
3. Measure on line AOQL = 1% (to left of line c = 1) the distance n/N = .21 obtained from Scale A. Read second approximation to value of n, $n_{a_2}$ = 66.
4. Repeat steps 2 and 3; the 2nd trial value of $n/N = \frac{n_{a_2}}{N} = .165$. Measure on line AOQL = 1%, the distance n/N = .165 obtained from Scale A. Read third approximation to value of n, $n_{a_3}$ = 69.
4. Repeat this iterative process until $n_{a_{i+1}} = n_{a_i}$. In this case $n_{a_4}$ = 69 also.

When n/N ≤ .25, a good approximation to the value of n may be found in one operation by using the value of $\frac{n_{a_1}}{N} - \left(\frac{n_{a_1}}{N}\right)^2$ as the first trial value of n/N.

# BOOK REVIEWS

## *W. D. Baten, Editor*

*26 University Drive, East Lansing, Mich.*

SAMPLING PROCEDURES AND TABLES FOR INSPECTION BY ATTRIBUTES, MIL-STD-105B, U. S. Government Printing Office, Superintendent of Documents, Washington 25, D. C., 40¢. Reviewed by Herman H. Bogin, Parke, Davis & Company.

In 1942, the Army Ordnance Acceptance Plan was adopted and led to the ASF (Army Service Forces) Plan in 1944. This was followed by JAN (Joint Army and Navy) in 1949. In 1950, the government issued the MIL-STD-105A. An appendix followed the last named in 1955. In 1959, the Department of Defense has combined MIL-STD-105A and the appendix to give us MIL-STD-105B.

There were some definite changes in the philosophy and in the probability underlying the tables supplied with ASF, JAN and 105A. Indeed, the changes were so great that in 1951, Seymour J. Lorber and Eugene L. Grant wrote an excellent technical report on a comparison of these three publications.

Such is not the case in comparing 105A and 105B. They contain the same tables, adopt the same risks and are very similar. We do believe, however, that some comments are in order.

For anyone accustomed to the older 105A, we would call attention to the fact that on Page 15 of 105B, one can find a guide indicating the relationship of the old table numbers to the numbers of the corresponding tables in 105B. On Page 60 is an Index of Terms, not found in 105A.

Some of the paragraphs are more elaborate or are presented in a clearer way in the new edition. In this group we would mention paragraphs #5, 8 and 9.

We believe tables III and IIIB might better have been printed on the same page or on adjacent pages, rather than to have been separated by parts of table IIC.

The OC curves are on the reverse side of the same sheet which is used for any given table. This enables a person to put the full story of any sampling plan on one sheet of paper, if it is desired to separate this particular plan from the rest of the book. However, there was some advantage in the 105A printing, which made it possible to examine the curve and the plan on the opposite sheet, without turning the page.

All in all, the new issue represents some improvement and is on the whole, one of the very useful publications released by the government. The practical and efficient nature of acceptance by scientific sampling techniques has been recognized and accepted by industry. Anything which simplifies, or helps, or improves these methods or the application of these methods, is certainly desirable.

EXPERIMENTAL DESIGNS IN INDUSTRY, by Victor Chew, John Wylie and Sons, Inc. Pages v-268, $6.00. Reviewed by G. W. McElrath, head industrial engineering department, University of Minnesota, Minneapolis 14, Minnesota.

This book contains a set of papers which were presented at a symposium held at North Carolina State College Nov. 5-9, 1956. This symposium was given financial support by the Air Force Office of Scientific Research. Under the terms of the contract the Institute of Statistics was required

". . . to conduct a Symposium on the Design of Industrial Experiments . . . Specifically, this symposium shall:

(1) Provide expository and review papers on the present status of design and statistical techniques available to the research worker.

(2) Present newer developments in this field.

(3) Provide discussions of regression analysis, concepts of randomization, block designs, sequential multiple decisions procedures and such other statistical techniques as may be deemed appropriate.

(4) Present examples of actual experiences with various designs in industrial research."

When the papers were originally submitted to the Air Force Office of Scientific Research, the Proceedings of the symposium contained three groups of papers. However, only the first two parts are included in this volume, as the papers in the third part have either been published or have been submitted for publication in the technical journals. The titles of the omitted papers together with the names of their authors and details of publication are given in the Preface of the book.

Perhaps one of the best ways for the readers of this review to catch the spirit of the book is to list its contents.

Part I. Review of Experimental Designs Useful in Industrial Research
Basic Experimental Designs
by V. Chew
Complete Factorials, Fractional Factorials and Confounding
by R. L. Anderson
Simple and Multiple Regression Analyses
by R. J. Hader and A. H. E. Grandage
Experimental Designs for Exploring Response Surfaces
by G. E. P. Box and J. S. Hunter

Part II. Industrial Experiences with Experimental Designs
Experiences with Incomplete Block Designs
by W. S. Connor
Experiences with Fractional Factorials
by W. H. Horton
Application of Fractional Factorials in a Food Research Laboratory
by M. B. Carroll and O. Dykstra, Jr.
Experiences with Response Surface Designs
by R. M. DeBaun and A. M. Schneider
Experiences and Needs for Design in Ordnance Experimentation
by C. A. Bicking

Bibliography

It now becomes obvious that the first section of the book reviews the classical designs and gives an account of factorial experimental designs in both complete and incomplete blocks. The book also

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provides a detailed exposition of regression analysis necessary for a better comprehension of the discussion of designs for response surface fitting.

The second section of the book presents industrial experiences with experimental designs in a framework of reference that is very readable and informative. Actual illustrations of incomplete blocks, fractional factorials, and response surface designs are given together with the respective data and analysis. In general, a person who has a basic knowledge of probability and statistics should have no trouble reading this book. Of course, such basic knowledge certainly should include tests of significance, confidence intervals together with the principles of regression analysis and analysis of variance. Even though the book starts each topic from what might be considered an elementary approach, a mathematical maturity of calculus and the elements of matrix algebra would prove very beneficial.

The book has a wealth of references which introduce the reader to many areas of experimental design. In addition to the references concluding each paper, there is a biliography which is divided into three sections—response surface fitting methodology, fractional factorials and miscellaneous. The last section is intended to illustrate the application of statistical methods and experimental designs (other than surface fitting and fractional factorials) to the various fields of industrial research. The bibliography in the first two sections is reasonably complete. However, certainly no attempt was made to exhaust the literature in the third section. Such an undertaking would involve the listing of several thousand articles. Instead particular selections have been made from the various research areas.

For those who are interested in reading a refreshing presentation of the topics included in "Experimental Designs in Industry" this book becomes a valuable addition to a library of quality control and industrial statistics.

ENGINEERING STATISTICS, by Albert H. Bowker and Gerald J. Lieberman, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1959, pages xiv - 585, $11.00. Reviewed by Dudley J. Cowden, University of North Carolina.

This is really two books, the first eleven chapters (377 pages) dealing with statistical theory and statistical methods used in industry, and the last two chapters (215 pages) dealing with quality control. A considerable part of the book is taken, with little change, from Bowker and Lieberman, *Handbook of Industrial Statistics*, which is a section of Grant and Ireson, *Handbook of Industrial Management*.

Topics covered, in this order, are: Probability distributions; tests of hypotheses; point and interval estimation; analysis of variance; analysis of enumeration data; control charts; sampling inspection. There is an ample number of problems for the reader to work out at the end of most chapters.

A typical approach includes: (1) a verbal and symbolic statement of the test; (2) OC curves to enable the statistician to determine the sample size; (3) analytical (mathematical) treatment; (4) numerical illustration of the procedure. The analytical treatment is generally starred, meaning that it is among the sections that may be omitted if one wishes. The authors suggest that an elementary knowledge of the calculus is a prerequisite for the book. The reviewer feels, however, that one need only to understand the language, as distinguished from the method, of calculus to understand the book. On the other hand, the style of the author is perhaps unnecessarily mathematical, and one inadequately trained in mathematics may find that he makes progress rather slowly.

The reviewer considers the chapter on Analysis of Variance to be very good. The many OC curves are also an excellent feature. On the other hand, he considers the discussion of statistical decision theory to be rather skimpy. Since the book is intended for those who are, or will be, working for business organizations, some discussion of how to design a test in order to maximize net profit should be useful. If the problem cannot be solved, at least it should be recognized, and its elements carefully considered. The last section of the book, on Continuous Sampling Inspection, is rather tedious. A number of alternative plans are described, but not illustrated, and there is not enough guidance to permit the beginner to choose confidently among them. The feature of the book that the reviewer dislikes the most is the sharp separation of quality control from statistical methods in general. The symbols are almost completely changed in the quality control chapters, and sometimes the concepts. For example, in the first part of the book $\sigma$ means population standard deviation, while in the second part $\sigma$ means $\sqrt{\Sigma(x - \bar{x})^2/n}$. In the first part of the book $s$ is used to mean $\sqrt{\Sigma(x - \bar{x})^2/(n - 1)}$. In the control chart section the divisor is n, but in the acceptance sampling section it again becomes $n - 1$. The change in notation is for the purpose of retaining conventional statistical symbols in the first part of the book, and the official symbols of the American Society for Quality Control in (most of) the second part. The reviewer believes that a unified set of symbols is better, such as those used in Cowden's *Statistical Methods in Quality Control*, which used conventional statistical symbols throughout, or Duncan's *Quality Control and Industrial Statistics*, which uses standard quality control symbols throughout.

There seem to be a few misprints that may further confuse the perhaps already slightly confused reader; but such misprints are as few as one could reasonably expect.

Most quality control or industrial statisticians should have access to this book. Something previously not known or not understood will be discovered by nearly everyone.

## *Tenth Textile Division Conference*

**The ASQC Textile Division is planning the biggest Conference to date for its 10th Anniversary this year.**

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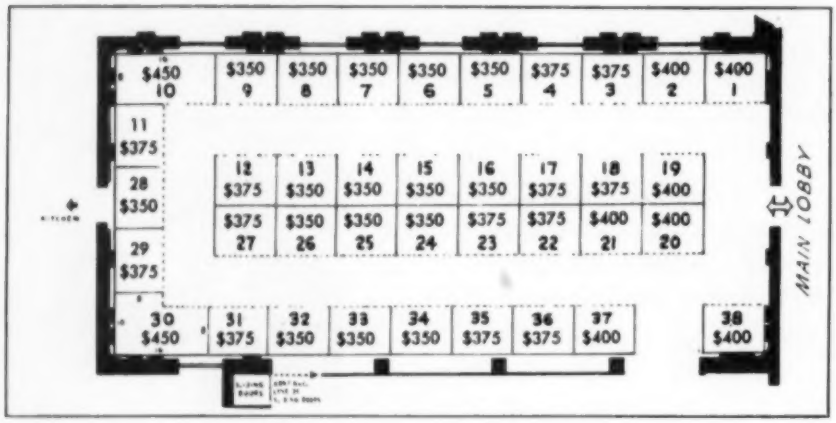


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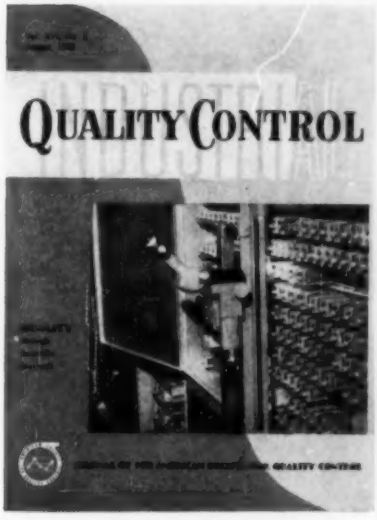


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ROY A. WYLIE, *Editor*
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**P-10-7**—A direct-reading, dual-purpose v-t bridge (Type 1661-A) with an amplification-factor ($\mu$) range of 0.001 to 10,000, which can be used to measure not only low-frequency dynamic coefficients of tubes, but also of transistors, over wide ranges of values under a variety of operating conditions, is available from General Radio Company. The bridge, designed to operate in the 270-400 cps or 1000-cps frequency range, makes use of ac null-measurement techniques, with special consideration to phase shift and capacitance errors to insure a wide operating range. Independent vacuum tube measurements can be made on forward and reverse voltage-amplification factor, resistance and transconductance; the transconductance of a tube having a high grid-to-plate capacitance value can be measured without error from this capacitance. A switching arrangement permits sequential measurement of both sections of twin triodes, twin pentodes, etc., without the need for reconnection of patch cords. For tests with self-biasing cathode resistors in circuits—now required for several tube types, a panel switch has been provided to select the tube section and also to connect the cathodes to a system of three pairs of binding posts; thus the self-biasing resistors can be connected to the separate cathodes or to the cathodes in parallel. In transistor applications, the bridge can be used to determine short-circuit conductance parameters—including the hybrid-input impedance ($h_i$) parameter—and the forward and reverse voltage ratios, including the hybrid ($h_r$) parameter. The short-circuit current ratio factors ($h_f$, a and $\beta$) can be determined from the ratio of two conductance measurements. Other open-circuit parameters can be calculated from the short-circuit parameters. Thirteen adaptor plates are available for plugging in tubes and transistors. The dynamic internal plate-resistance range of the bridge is 50 ohms to 20 megohms; transconductance, 0.02 to 50,000 micromhos. Maximum allowable plate current is 400 ma; maximum plate voltage, 1500. The bridge is 18½ inches long by 15¾ inches wide and 11 inches high.

★ ★ ★

**P-11-4**—Wm. Ainsworth and Sons have announced that the company is now in production on its new automatic recording vacuum balance. This new balance has the advantage of being able to weigh samples in air or inert gases; at atmospheric or reduced pressures; at room or higher temperatures; on the balance pan or suspended below the balance in a furnace for thermogravimetry or differential thermal weighing. Weights are built into the balance and are operated by controls outside the vacuum chamber. The recorder, developed last year for use with the Ainsworth standard analytical balance, charts weight, or weight and temperature against time. The vacuum balance is available in semi-micro and analytical models. The semi-micro unit has a capacity of 100 g., sensitivity of 1/100 mg., and a range of automatic weight operation of 400 mg.; the analytical, 200 g., 1/10 mg., and 4000 mg. respectively.

★ ★ ★

**P-9-11**—A new Vibration Interferometer for precise checking and calibration of accelerometers has been introduced by Gaertner Scientific Corp. The Vibration Interferometer permits extremely accurate calibration of the accelerometers used to measure vibration of completed assemblies, sub-assemblies, and individual piece parts under environmental tests. It is especially designed for the calibration of accelerometers of the Gulton and Endevco types. Because the amplitudes of vibration are of the order of a few millionths of an inch, the Interferometer principle is used. Interferometry employs the wavelength of light as the basis of measurement. This extreme precision enables the accelerometers to be calibrated to values that permit them to be used as secondary standards, such as in the calibration of shaker tables and similar applications. The Gaertner Vibration Interferometer consists of three major components, the Interferometer, Multi-Beam Stroboscopic Slit Assembly with white light source, and a Vibrator. Frequency range is approximately 450 to 10,000 cycles. Double amplitudes over a range of one to 1,000 micro-inches can be determined to an accuracy of $10^{-6}$ inches or 1 percent, whichever is greater. If the user already has a vibrator and associated electronic equipment, it may be possible to adapt these to the Gaertner Interferometer and Strobe Slit units.

★ ★ ★

**P-9-8**—A new portable eddy current instrument has recently been added to the group of testing systems available from Magnaflux Corporation. By accurately measuring electrical conductivity, the battery powered Magnetest FM-110 Conductivity Meter performs a variety of testing jobs, including the determination of hardness, alloy, and heat treat condition; sorting mixed nonmagnetic metals; checking tensile strength of aluminum; investigating fire damage to aircraft; and many others. Readings can be taken on a comparative basis using known samples, or in absolute electrical conductivity units as a percent of the International Annealed Copper Standard. The FM-110 induces eddy currents within the test piece by means of a ½ inch diameter hand held probe. These currents affect the impedance of the probe coil as a function of the conductivity of the material. With the probe on one side of the test piece, the large knob is turned to zero the meter and conductivity is read on the left hand scale. The compact 3⅜ inches × 8¾ inches × 6½ inches instrument, weighing only 4½ pounds, can be used for both production and on-site testing. Total range is 8 percent to 107 percent I.A.C.S., with an accuracy better than ± 3 percent of scale reading, and usually better than ± 1 percent when used on a comparative basis. Three volts from two standard flashlight batteries power the self-contained unit. A built-in battery checker indicates whether the batteries meet the required operating voltage range.

★ ★ ★

**P-11-1**—The Lindly Dyna-Micro-Gage, a new photoelectric instrument, is a compact, highly sensitive device for measuring minute changes of light. It is capable of accurate dynamic measurements down to ½ micron or less. Since it is photoelectric, the materials being measured do not contact the gage and humidity does not affect its accuracy. The unit is stable and relatively unaffected by temperature changes. Drift has been reduced to a minimum and the instrument requires only occasional resetting when used at the higher levels of sensitivity. On the standard Gage, diameters up to ¼" may be measured

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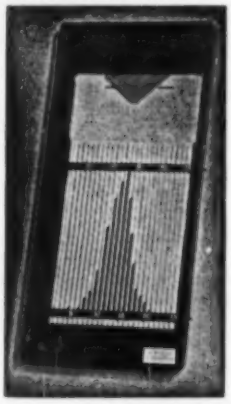
to make your in-plant training course more effective



The Quincunx is a must for presentation of basic quality control principles. Demonstrates visually to your audience how a Normal Distribution pattern is formed. Also demonstrates how various Non-Normal distributions are formed.

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directly but much greater dimensions may be checked by the use of special gaging heads, special adapters or multiple heads. Since the Lindly Dyna-Micro-Gage is a comparative type device, it must initially be set up with a known standard. Only infrequent recalibration against the standard is required after that. Typical uses are the continuous gaging for diameter of bare, coated, or insulated wire, synthetic textile yarn, thread, cord, line, etc. It may be used for continuous gaging for width of sheet, strip, tape, and flat wire. It has been used for rapid measurement of small hole sizes such as the extrusion spinnerets for synthetic yarn. Larger holes may be measured for roundness as well as size. It is impossible to continuously measure small changes in strength of chemical solutions, mixtures, dispersions, etc. by detecting minute changes in light transmission. In addition to diameter, it will measure out-of-roundness of wire, yarn, thread, line and also make linear measurements. Used as a strain gage, it will measure very small deflections and can be used to measure the homogeneity of transparent media such as glass, plastics and liquids. The output voltage of the gage can perform the following:

Operate a meter which can be set on any desired sensitivity scale.

Be recorded on an accessory recorder to give a graphical record of variations detected by the gage.

Actuate a relay which, in turn, can actuate a signalling, stopping, starting or feedback circuit.

Operate a meter with high-low, tolerance or limit settings to signal, record or perform some other function when these settings are reached.

★ ★ ★

**P-11-3**—New features for reduced maintenance downtime and improved performance are incorporated in a redesigned mass spectrometer leak detector now available from General Electric. Among improvements in the new model are a quick-change self-aligning filament, a new automatic balance measurement circuit, enlarged capacity vacuum pumps, new easy-to-read panel meters, and general maintenance improvements. The M-60 mass spectrometer leak detector locates leaks as small as $1 \times 10^{-10}$ cubic centimeters of air per second, so small that less than one cubic inch of air at atmospheric pressure would pass through in 5,000 years. It is used to check out vacuum tubes, transistors, valves, connectors, missile devices, nuclear systems, and other products where extremely small leaks may seriously impair quality. Leaks are located by applying helium tracer gas to one side of the enclosure while the leak detector draws a sample of air from the other. If helium is present in the gas analyzed by the detector, an alarm is given. Among maintenance improvements in the new M-60 unit, is a quick change filament procedure that is performed without shutting down the vacuum pumping system. Downtime required for replacing the filament is less than five minutes. The M-60 also fea-

One of many assembly lines of skilled operators employing AO CYCLOPTIC Stereoscopic Microscopes to assemble advanced germanium computer transistors at Texas Instruments vast Semiconductor—Components division in Dallas, Texas.

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When manufacturing small precision assemblies ... many progressive companies such as TI, depend upon the AO CYCLOPTIC to render the unit in visual "working size" dimensions.

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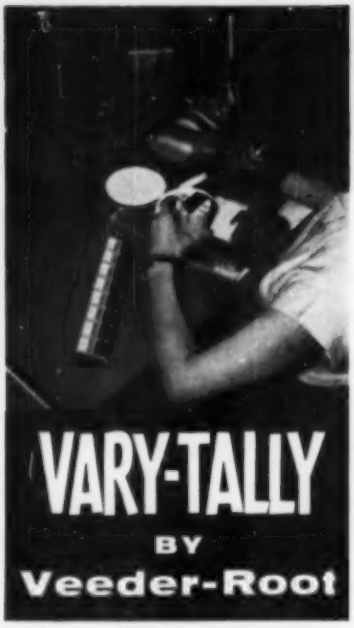


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tures a platinum-clad ion repeller that can be flame-cleaned during the same five-minute period. Maintenance of the electronic portions of the M-60 model has been simplified by mounting the components on individual removable panels according to their basic function. An improved vacuum pumping system can exhaust the unit to operating pressure in about thirty minutes from a cold start. The stainless-steel vacuum system includes a new low-loss cold trap that requires less than one-half liter of nitrogen every eight hours. The filament is protected by an over-pressure circuit, triggered by an easy-to-clean, cold-cathode-type vacuum gauge that cuts off filament power when pressure exceeds a safe operating value. A new automatic balance circuit allows the M-60 unit to operate effectively despite the presence of helium within its sensing circuit.

★ ★ ★

**P-10-10**—Reliability studies in the electronic industry have revealed that printed circuits, sub-assemblies and other important equipment are not always as clean as they should be. It has been discovered that solder flux, brazing flux, welding slag and other materials used in intricate electronic equipment often remain after cleaning operations. If not removed, these materials act as soils and contaminants. They can cause corrosion and current leakage and prevent film adhesion of potting compounds. When viewed under black light these contaminants, because of their fluorescence, are literally "built-in light beacons". They fluoresce bluish-white and yellowish for the most part. Further cleaning and constant black light checking removes the possibility of faulty operation of the electronic equipment. The Model B 100 Black-Ray Lamp used in a curtained booth with some diffused white light near the cleaning process, is an effective inspection device. Recommended black light inspection check points are: 1) after completion of the blank circuit board; 2) receiving inspection; 3) during cleaning process after mounting components on printed circuit and, 4) prior to installation of printed circuit.

★ ★ ★

**P-11-6**—A new high intensity sound system for acoustic environmental vibration testing of aircraft and missile components systems has been announced by Altec Lansing. The new system is designed to reproduce a controlled acoustic environment, with frequency and amplitude characteristics equivalent to those of actual flight. Basically, acoustic vibration testing differs from electro-dynamic vibration testing in the method of applying electronic signal force to the specimen. In acoustic testing, the electronic signals are fed to loudspeakers or other transducers rather than to the mechanical shakers which are used in electro-dynamic vibration testing. The specimen is suspended in a reverberation chamber and vibration is accomplished through bombardment by high intensity sound energy from the speakers. The new Altec Lansing acoustic vibration testing system consists of an aluminum double wall reverberation chamber with a 30 cubic foot capacity, and a power supply and control rack. The reverberation chamber contains 16 low-frequency and 16 high-frequency loudspeakers which convert the electronic signals to sound energy. Electric signals are supplied by eight 260 watt power amplifiers. Two band pass filters control the frequency adjustment of the four low-frequency and four high-frequency amplifiers. The band pass filters are slaved to a pair of Altec pre-amplifiers which serve as mixers of the low-frequency and high-frequency signals. A third Altec pre-amplifier mixes the resultant high and low frequency signals to provide a continuous "White noise" spectrum which is fed into the loudspeakers of the reverberation chamber. Two Altec Model 21 BR microphones are suspended in the reverberation chamber to verify sound pressure level. The microphones are calibrated before and after each test to assure accuracy. The system can produce 147 db of "white noise"—similar to the noise spectrum of the most powerful modern jet and missile engines.

### *New Literature Available*

**L-10-3**—A new six-page short-form catalog describing and illustrating 20 instruments, including some of the latest products, has been prepared by Wayne Kerr Corporation, designers and producers of instruments for electronic, physical and chemical measurements.

♦ ♦ ♦

**L-10-4**—A twelve-page booklet on Heavy Liquids is being offered by Engineered Materials. Both aqueous and organic liquids are described and for the higher ranges, suspensions of mercury in a heavy liquid. Organic liquids range up to 3.3 density, while aqueous liquids range up to 4.0 and melts extend this range to 5.0. Above this point, the mercury suspensions range up to 7.5 density. Above densities of 7.5, low melting point alloys can be produced to order. These heavy liquids are useful for the identification of many substances, including plastic, and are especially useful in quality control of ceramics and glass. They are also used in various instruments.

♦ ♦ ♦

**L-10-6**—Federal Products Corporation has announced two new catalogs. The first is a 32-page catalog describing the Federal Dimensionaire, one-master Air Gage System and providing specifications on two new Air Gage Models (10,000:1 and 20,000:1 magnification). The other is a four-page brochure describing the new Federal Miracle Movement Dial Indicator. The Miracle Movement is a new development which greatly extends operational life, providing substantially increased resistance to wear and shock.

# ASQC News

**David S. Chambers, Executive Secretary**

The Board of Directors held its mid-year meeting at Milwaukee on Nov. 13, 1959. The major items currently being considered by the Board are presented here for your information.

1. Membership—At the IQC cut-off date of Oct. 31, membership was 10,091. This was 89 percent of the June 30, 1959 membership and represents a notable improvement over the corresponding figures for the past two years, when the percentage hovered just above 80. It is a credit to the membership that this excellent performance results from an exceptional renewal rate. But the rate of acquiring new members is behind the forecast, indicating the need for real work here if the 12,000 target for next June 30 is to be reached.
   Won't each of you act as a committee of one to bring a new member into your section and Society this year?

2. New Section—The petition of the Orange Section in California was approved by the Board. It is the 111th section. Its officers are:

   111—Orange, California
   (Dist. 16)

   Chairman:
   Fred Peck
   Hughes Products-Semiconductor Div.
   Newport Beach, Calif.

   Vice Chairman:
   William F. Hurst
   Leach Corp.
   Compton, Calif.

   Secretary:
   Edgar A. Steinmeyer
   Kwikset Div., The American Hardware Corp.
   Anaheim, Calif.

   Treasurer:
   Paul M. Charron
   Robertshaw Fulton Controls
   Anaheim, Calif.

3. New Section Activity—Interest in the formation of new sections in the following locations was reported: in California, in the vicinity of Vandenberg Air Force Base; in Oklahoma, at Oklahoma City (Tinker Air Force Base); in Jackson, Miss.; in Southern Illinois around Carbondale and Granite City, a group presently a subsection of the St. Louis Section.

4. Workshop Seminar—The Management Workshop Seminar Nov. 12-14, 1959, in Chicago, was most successful. Plans were announced for holding a third Workshop Seminar in San Francisco, beginning on the last day of the Convention and extending the following two days.

5. Convention Dates—There has been much discussion at recent Executive Committee and Board meetings about convention dates. There is some feeling that the last week of May, traditionally the ASQC convention time, may not be the most convenient time for many members, as it conflicts with school terms. In November a questionaire was sent to section officers to determine whether another time would be more appropriate. The results are in and being studied now; if you have a strong preference, let the Milwaukee Office know so that it may be included in the survey results.

6. Real Estate Committee—The purpose of the Real Estate Committee is to investigate the feasibility and advisability of the Society owning its own property and Headquarters office building. The committee reported to the Board on its activities to date and will have more to report later as the plans materialize.

7. *Industrial Quality Control*—Of interest are plans to change the scheduling of *IQC*, beginning with the March 1960 issue. At present, IQC is received on about the 25th of the month of publication. This means the publication date is current for approximately a week. In March it is planned to advance the publication date three weeks to make the receipt date near the first of the month. The principal advantage will be that announcements of coming events for March can be made in the March issue and not in the February issue as they presently are.

8. Five-Year Index to IQC—All of the work in compiling the material for the Index to Volumes XI through XV of *Industrial Quality Control* has been completed and the material turned over to the Milwaukee office for production. It is expected that the completed Five-Year Index, which has been arranged in accordance with the Literature Classification System published in the September issue, will be ready for distribution early in the spring of 1960.

9. Associate Member Badge—The Board of Directors has approved a design for a membership badge for Associate Members of the Society. The center is blue with the control chart, as in other badges. The outer ring, containing the name of the Society, is in white enamel. In the near future, *Industrial Quality Control* will carry an announcement of the date of its availability.

The Board welcomes your views concerning these matters. Simply write the Director of your District or the Executive Secretary.

Changes in District Representatives—Samuel A. Oliva has been selected to fill the unexpired term of Warren J. Grosjean in District 1. Mr. Grosjean resigned effective November 1. Mr. Oliva's address is Old Turnpike Road, Concord, New Hampshire.

Carl E. Hoover, Perfect Circle Corp., Hagerstown, Ind., has been selected as District Representative of District 9. Mr. Hoover succeeds Joseph C. Grote, who has been serving in an interim capacity following the resignation of Paul Trotta in August.

## *Dayton Quality Control Conference*

Harry G. Romig, Hoffman Electronics Corp., will be the luncheon speaker at the Fourth Dayton Quality Control Conference Mar. 5, at the Biltmore Hotel, Dayton, Ohio.

During sessions from 9:00 a.m. to 4:30 p.m., speakers will cover inspection, quality control and reliability. Four concurrent sessions will be held in each of three subject areas. Topics will include training, budget, statistical dimensioning, machine capability and reliability management.

For further details and registration information, contact George A. Friesell, Dayton Air Force Depot (MDQ), Dayton 20, Ohio.

# section briefs

**AKRON-CANTON** . . . Harmon Bayer, QC Consultant, presented an interesting and challenging talk at "Management Night" to approximately 100 persons. Many guests were present who represented top management of the companies of the members.

**ALBANY** . . . Alan Hoffman, General Electric Co., spoke on "Solving Linear Programming Problems by Inspection," Nov. 12. During the afternoon session, Don Holmes, section chairman, introduced the group to linear programming by going through the classic transportation problem step-by-step. Enthusiastic acceptance of this meeting was indicated by all those who attended.

**ALBUQUERQUE** . . . M. F. Wilson, QC Director, Collins Radio Corp., Cedar Rapids, Ia., spoke on "Reliability of Electronic Components," at the Nov. 9 meeting. The talk was interesting, informative and gave new insight regarding the solution of reliability problems during assembly of electronic equipment. During the informal discussion period which followed the talk, coffee and doughnuts were served.

**ALLENTOWN-BETHLEHEM** . . . The November meeting took the form of a plant tour through the new Air Products, Inc., plant at Trexlertown, Pa. Many members of our section as well as a number of guests took advantage of the opportunity to see one of the newest and fastest growing industrial plants in the East.

Richard Wetherhold was in charge of arrangements at Air Products. Mr. Wetherhold has held several section offices during the past years.

Looking forward to the February meeting, this reporter is anxious to participate in our next pre-meeting clinic since our first endeavor was so successful. We heartily recommend these clinics to all of our members and friends.

**BALTIMORE** . . . At the Nov. 17 meeting, Bernie Cunningham, reliability engineer, Minneapolis-Honeywell Regulator Co., Duarte, Calif., spoke on "Dimensional Measurements Using Non-Destructive Testing." He described some uses of non-destructive testing techniques such as radiography and ultrasonics for the dimensional inspection of reactor components. A large turnout of members and guests thoroughly enjoyed his presentation which was followed by a lively question and answer session.

An executive committee meeting has been planned to discuss the execution of our original plan to personally contact management of industrial firms in the Baltimore area to acquaint them with ASQC objectives. Frank Cullen, section chairman, is formulating the plans.

**BINGHAMTON** . . . A very fine turnout at the meeting Nov. 18, heard Richard Bingham, QC manager, Coated Abrasive Division, Carborundum Co., as the guest speaker. His presentation was enthusiastically received.

Special guest was T. Mizusawa, chief of the quality control section, Oki Electric Industry Co., Ltd., Tokyo, Japan. He is presently in this country under the auspices of the Industrial Engineering Training Program conducted by the International Co-operation Administration and the Japan Productivity Center.

The February 24 meeting will be a part of the annual technical and engineering council dinner at the Endicott E. J. recreation center. Dr. Clifford C. Furnas, Chancellor of the University of Buffalo, will discuss "The Next 100 Years."

Dr. Furnas is a renown educator, scientist, author and lecturer. He has served in industrial, educational and governmental positions. Among his many duties have been that of chairman of the guided missile committee of the U.S. Research and Development Board and chairman of the Advisory Panel on Aeronautics, Department of Defense.

**BUFFALO** . . . Allin P. Deacon, Deacon and Associates, Brantford, Ont., and ASQC executive director, addressed a meeting of the Buffalo-Niagara Falls section Nov. 30. Mr. Deacon spoke on "Management of Statistical Quality Control in the Smaller Industries."

He explained that QC has flourished in the large industries as a separate department of the organization. Managements of smaller industries, in many instances, have felt that they could not afford the expense of a QC department. Many small plants may have only one inspector and in many instances none. The speaker described a number of organizational arrangements which have worked effectively to control quality and reduce manufacturing costs in the small plants. Case histories were given, together with illustrations of the simple paperwork involved.

**BOSTON** . . . At the meeting Nov. 12, W. A. MacCrehan, Bendix Aviation, Baltimore, Md., gave 150 of us a grand evening. "Vendor Certification and Control of Incoming Materials," is his favorite subject. He demonstrated his points with the help of slides. A Boston section charter member—a true "Qualitonian"—Mr. MacCrehan has talked to us many times, but we always call him back for "one more."

During the evening, vice chairman W. A. Donovan, QC engineer, B. F. Goodrich Co., Watertown, Mass., was surprised by the photographer, Shant L. Chebookjian, QC engineer, Polaroid Corp., Cam-Bridge, Mass., as he was admiring the gun Mr. MacCrehan used to show how to eliminate the villainous rustlers "Waste," "Rework," and "Scrap."

After the turkey and cranberries (Cape Cod, however), but before the talk, 24 certificates were awarded to those who completed our fall lecture series, "Introduction to Quality Control." Bob Fabian was the education committee member in charge of the program, and D. J. Harrigan and W. S. Hertzmark were the instructors.

**CHICAGO** . . . The Chicago section joined with other member sections of the Chicago Technical Societies Council in the annual Awards Dinner, which honored the achievements of notable local educator-scientists. The principal address was given by Carl S. Winters, consultant for the General Motors Corp.

For the general meeting Feb. 17, the 4:30 p.m. speaker will be a section member who will discuss his QC experiences. The speaker has not been announced.

The evening speaker will be John Jasch, purchasing agent, Victor Adding Machine Co. Mr. Jasch is former chairman of various committees of the Purchasing Agents Association. He will discuss, "A Purchasing Agent's Viewpoint of QC." Keep this date open—Feb. 17—to attend this afternoon and dinner meeting.

The Chicago section is repeating its Inspection Training Course, which starts Jan. 26. The course will run approximately 17 weeks, meeting Tuesday evenings at Navy Pier. Further details can be obtained by contacting Samuel Richards, Hammond Organ Co., 2915 N. Western Ave., Chicago 18, Ill. Phone BR 8-4100.

**CLEVELAND** . . . One of the largest turnouts of the season was on hand Nov. 6, to hear Edwin C. Harrington, Monsanto Chemical, Springfield, Mass., talk on "Response Surface Experimentation." Mr. Harrington's talk was most informative with practical examples suited for all levels of interest.

In the timely discussion which preceded the Nov. 6 meeting, Donald Leckie, Republic Steel Corp., Cleveland, Ohio, lead a discussion on the "Monte Carlo Technique."

All members of the section are awaiting to hear of the experiences of our own section member, Henry Birkenhauer, when he talks on "Quality Control in the Antarctica." This meeting should be the most interesting and unusual meeting of the season.

**CHARLESTON** . . . This ASQC exhibit at the First Biennial West Virginia Mining and Industrial Show was staffed by M. A. Aitken, W. E. Stricklen, W. R. Kellogg, P. T. McCoy, C. M. Drummond, C. J. Haines, J. W. Kearns, B. C. Wetzel, R. A. Remke, W. H. Swango and H. C. Morton.

Sampling accuracy, the theme of the exhibit, was depicted by sampling, weighing, calculating, and plotting points on a large control chart during the three day showing. Numerous visitors returned again and again to check on the progress of the experiment.

The Charleston, W. Va., Chamber of Commerce sponsored the show Sept. 23-25, 1959, at the Charleston Civic Center.

At the November meeting of the Charleston section, William E. Barker, District 8 Representative, Jet Engine Division, General Electric Co., presented "Are You Sure," which dealt with the problems of instrument and gage repeatability. He then met informally with the executive committee to discuss section administration.

**CINCINNATI** . . . At the Nov. 18 meeting, Harry O. Hehner, QC manager, Monsanto Chemical Co., St Louis, discussed, "How You Can Make a Multiplant QC Program Work." His presentation on unique methods and techniques for installing quality at the various plants was most enlightening. Among the techniques discussed were the plant product quality staff, plant newspapers, letters to the employees prepared by management, and various articles prepared by management.

R. J. Fopma, a section member and a member of the professional development section liaison committee, gave the coffee talk address "New Developments in the QC Profession."

Two meetings are scheduled for February. Winston C. Dalleck, consultant, McKinsey & Co., will discuss "Monte Carlo Applications," at the Feb. 17, technical meetings. "Statistical Methods in the Chemical Industry" will be the subject of a symposium with the American Chemical Society on Feb. 29. Ralph A. Bradley, chairman, department of statistics, Florida State University, and Harry Smith, Jr. Proctor and Gamble Co., will be the speakers for the symposium.

**COLUMBUS** . . . The meeting Dec. 10, at the Southern Hotel, was a panel discussion on "Quality Motivation in Industry." The moderator and panel—men in QC, Industrial Engineering and Labor Relations—gave the members their experienced opinions to questions on the numerous aspects of quality motivation.

W. E. Barker, our new District Representative, will speak on "Organization Quality," Feb. 17, at Westinghouse Electric Co. His talk will cover the organization and operation of the QC function at the Jet Engine plant of General Electric Co.

**CORNING-ELMIRA** . . . The November meeting was highlighted by A. J. Duncan, John Hopkins University, who spoke on "Process Capability Studies." Professor Duncan restricted his talk to controlled processes, pointing out that studies of uncontrolled processes will reveal what a process has done but can not be used to predict the future.

A fine dinner, enlightening speaker—very enjoyable.

**DELAWARE** . . . The 27 members and guests who attended our Nov. 5 meeting were treated to a very interesting, informative, and yet highly entertaining talk on "Executive Search."

John W. Costello, NESINC president, painted an almost "Pie in the Sky," picture of job opportunities in the U.S., and what he considered the best approach to capitalizing on them.

**EVANSVILLE-OWENSBORO** . . . An extremely interesting meeting was held at Gabe's Restaurant in Owensboro, Nov. 17. James F. Bourquin, plant manager, St. Paul Division, Whirlpool Corp., St. Paul, Minn., was the speaker. Mr. Bourquin spoke on "Top Management Decision Making."

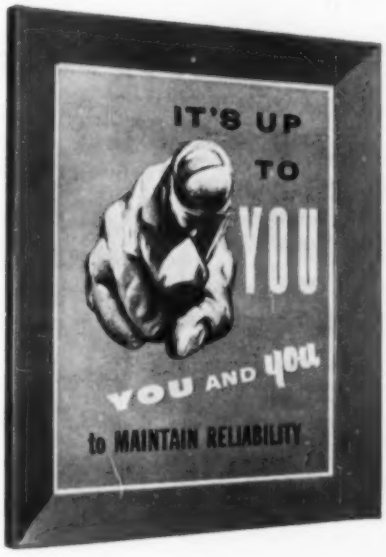
The February meeting will be held at the Shady Restaurant in Owensboro, Ky. L. J. Smith, manager, industrial engineering department, Mead Johnson & Co., Evansville, Ind., will speak on "Work Sampling" Feb. 16; dinner at 6:30 p.m.

**GRAND RAPIDS** . . . Nov. 12 membership braved the snow and ice to listen to a very interesting talk by J. H. Molnar, QC manager, Houdaille Industries, Inc. Mr. Molnar spoke on "QC—A Tool for Management's Use."

**GREATER DETROIT** . . . The Nov. 12, meeting was held at the Ford Motor Co., Ypsilanti plant. The evening featured a plant tour and a conference on "Quality Methods in a Manufacturing Operation." The meeting presented an opportunity to see and hear practical applications of "Total Quality Control" concepts at one of the large manufacturing plants in the Detroit area. Quality methods from engineering and laboratory test phases through production and analysis of field data were discussed. The speaker was James Keene. Ford Motor Co.

The Blue Water sub-section members held their "International Night" on Thursday, Nov. 19, at Port Huron, Mich. The speakers were Raymond L. Banka, director and past chairman, Blue Water subsection, and M. J. O'Callaghan, director and past chairman, Toronto section, ASQC.

**HAMILTON** . . . Nov. 14, we held our 3rd Annual All Day Forum at McMaster University. The attendance and general interest far exceeded the expectations of all the committees who worked so long and diligently to insure its success. The presentations of the speakers were excellent.




**QUALITY - RELIABILITY - REPUTATION** are words that take on a new meaning for employees when used in the colorful and compelling

**ELLIOTT HI-VISION PROGRAM**

(See page 33)

As a direct result of our Forum, Neil McCarthy, our vice chairman, gave a one hour talk on quality to the student body, at the request of McMaster University.

Our next regular meeting Feb. 11, will bring to us P. J. Robinson, Imperial Oil Co., who will speak on "Operations Research."

**HAMILTON-MIDDLETOWN** . . . Miss Bonnie B. Small, department chief in engineering, Western Electric Co., gave an interesting and informative talk on "Training of Management in Statistical Quality Control," at our annual management night meeting, which was a huge success.

William Murstein, Hamilton businessman, presented a coffee talk on "My Impressions of Russia."

A. V. Feigenbaum, manufacturing operations and quality control service, General Electric Co., will speak on "The Road Ahead for QC," at our Feb. 10 meeting.

A coffee talk will be presented by Sgt. A. M. McBrayer, U. S. Army, on "The Guided Missiles Are Here."

**HARRISBURG** . . . Simon Collier presented a very interesting film on QC taken at the Johns-Manville Co., plants, at our dinner meeting Nov. 4, at the Castigilia Restaurant, Harrisburg. The movie showed operators performing their various jobs. This brought to light the errors of mishandling the products, which will cause rejects at final inspection. These were not apparent to the operators themselves until they viewed the film.

The section will hold a "buzz" session at the Yorktowne Hotel, York, Pa., Feb. 3. J. T. Skelton, Caterpillar Tractor Co., York, Pa., will be the moderator. This will allow all members and guests to participate in various group discussions with each group assigned a leader. These leaders will be section members representing all companies in this area.

**HARTFORD** . . . Hats off to the following section members for their participation in the Thirteenth New England QC Conference:

Frank J. Hauman, QC engineering supervisor, Royal McBee Corp. Frank was the instructor in an educational session, "Introduction and Basic Concepts."

Kenneth Martin, Jr., QC supervisor, Holo-Krome Screw Co., an instructor in another educational session, "Control Charts, Their Computation and Application—Including Process Capability."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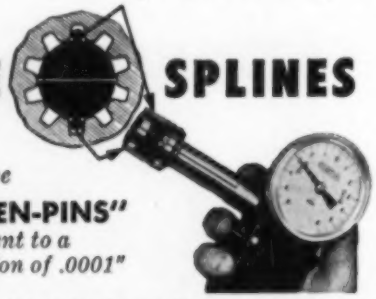

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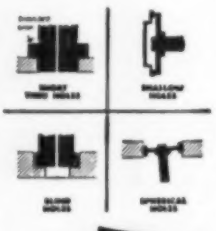

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Conrad E. Chilone, chief inspector, Anemostat Corporation of America—Chick was another man in the statistical engineering presentations and did a bang-up job with his presentation of "Mechanical Pre-Control" and unrelated subjects.

Fredrick Jacobs, James Gleed, Tony Manzi, and Eugene Ellis, Jr., served as moderators.

**HUNTSVILLE** . . . John D. Beal, Jr., spoke on "Statistical QC in Italy," at the Nov. 12, meeting at the Elks Club. His talk was based on his experiences in QC during a recent 3½ year tour of duty in Europe with the Navy Off-Shore Procurement program. Prior to coming to the Industrial Division of the Army Ballistic Agency, Mr. Beal was head of the industrial management department of the Navy Ammunition Depot, Hingham, Mass.

**INDIANAPOLIS** . . . Virgil L. Anderson, director of the Purdue University statistical laboratory, spoke to a combined group from ASA and ASQC on "Design of Experiments," at the Nov. 10 meeting. The Indianapolis section wishes to recommend Professor Anderson to other sections for his ability to adjust his sights to a particular group and give new insight into the use of old techniques.

During the "Kaffee Klatsch" which followed the meeting, our new district representative, Carl E. Hoover, Perfect Circle Corp., met informally with members of the executive committee. It was decided that even though Carl is a past president of the Indianapolis section, he should be formally introduced as the District 9 representative at our December meeting.

**IOWA** . . . A two day meeting Nov. 19-20, included a plant tour of the Oscar Meyer Packing Co., Davenport, Ia., on the morning of the 19th.

During the afternoon, a discussion of the plant tour was followed by an instruction session on "Acceptance by Variables," by Robert W. Boeke, production superintendent, John Deere Industrial Equipment Works, Moline, Ill. R. Black, staff assistant, International Harvester Co., Moline, Ill., gave the after dinner talk.

The morning of the 20th, William D. Baten, Michigan State University, East Lansing, Mich., conducted a technical session on "Lot Plot Techniques."

The two day meeting adjourned at 11:30 a.m.

**JOPLIN** . . . Ernest C. Goforth, QC manager, Pacific-Mercury Electronics Co., spoke on "QC for a Small Electronics Plant," at the November meeting. The meeting at the Hickory Hills County Club, Springfield, Mo., was well attended and thoroughly enjoyed by all present.

A tour of the Springfield, Mo., works of the Trailmobile Co., was made after the business meeting.

**LEXINGTON** . . . Forty nine members and guests listened to a presentation on quality problems in the glass industry at the Nov. 19, dinner meeting at the Officers' Open Mess. Lexington Signal Depot. Guest speaker was senior member Vernon W. Brown, Owens-Illinois Glass Co., Toledo, Ohio.

The Lexington section presented a one hour panel discussion of ASQC activities over radio station WBLG, Lexington, Nov. 12, and a fifteen minute television interview on WLEV-TV, Lexington, Ky., Nov. 16. A panel, consisting of William Eckert, IBM; Glenn Padgett, Lexington Lamp Plant, General Electric Co., and Archie Dedman, U. S. Army Signal Corps., presented the program. Announcements were made inviting interested persons to attend our meetings. On the television program, the society emblem was prominently displayed in the background, and a close-up shot of the latest issue of **Industrial Quality Control** was shown.

**LIMA** . . . The section has completed a highly successful fall educational program. The two courses offered were measurement and gages and basic statistical QC. Sixty-nine students were enrolled.

The spring session of the QC school running through January, February, and March has been set up to offer courses in acceptance sampling and intermediate statistical QC.

**LOS ANGELES** . . . The February meeting will be held as a one day Reliability Symposium. Jack Lancaster and Frank Squires are co-chairmen. In view of the high attendance at the June and September meetings, indications are that this symposium will be well attended. We ask that those persons planning to attend reserve their spot well in advance. The fee for this event is $12.00. Registrations will be limited to about 300.

Speakers for this event are: Ben I. Funk, Major General, U. S. Army, commander of the Ballistic Missile Center; Harry Powell, reliability coordinator of systems technology laboratory; John J. Riordan, staff director of QC, Department of Defense; Leslie Ball, reliability consultant; and H. Eppenstein, chief of reliability engineering, Convair Astronautics.

Paul Sternberg and Ray Hendricks, Hughes Aircraft Co., were the speakers at the November meeting. Their topic was "Use of Data Processing in Evaluation of Vendors."

The Orange section received their charter and conducted installation of officers at a dinner social Nov. 20. The Los Angeles section is happy to welcome our new neighbor section and glad to have been in assistance in helping them get started.

**LOUISVILLE** . . . Carl Noble, Kimberly-Clark Corp., will speak on "Statistical QC in Operations Research," at the meeting Feb. 8, at Jimmy Lynn's restaurant.

**METROPOLITAN** . . . On Nov. 12, the Metropolitan section held another very well attended and successful "Buzz Session."

The theme and direction was set by W. R. Pabst, Jr., chief statistician, Bureau of Ordnance, Navy Department, Washington, D. C., in his talk on "The Role of QC in Management Decision Making."

Individual groups were seated at tables designated by representative industries (electrical-electronic, chemical-pharmaceutical, and aircraft-mechanical) under the able direction of table chairmen who were members of top management in the particular industry. Topic covered in the groups were "QC reporting Systems," and "Who Defines Quality Standards."

A very stimulating and profitable evening was the result, and, of course, Danish coffee cake and coffee was enjoyed by all.

Let's all get out to the Hotel Statler in New York on Feb. 26-27, for our Metropolitan Conference on Quality Control!

**MONTREAL** . . . The Ottawn sub-section's first meeting of the year was held Nov. 18. The topic was vendor-vendee relationships. Speakers were Alex McIntyre, DND Inspection Services, and Larry Sellick, RCAF CQC. Mr. McIntyre outlined the various vendor certification agreements and systems which have found favor in the United States. Mr. Sellick outlined the inherent advantages to be derived from a Total Quality Control approach down to the subcontractor's operation. He also recommended quality audits of suppliers both before the subcontract and during deliveries. Both speakers were of the opinion that membership in ASQC was one of the best means of cementing vendor-vendee relationships. A lively discussion followed the talks.

**NORTHEAST TENNESSEE** . . . At 6 p.m., Nov. 18, panel discussions on "Inspection and Test Methods" and "Control Charts" were the subjects of well-attended and lively discussions. After discussions a roast beef dinner was served. This was followed by the introduction of the guest speaker, David Chambers, ASQC executive secretary.

Mr. Chambers reported on the results of the ASQC Board Meeting, where Professionalism and other matters of importance to QC personnel were discussed. Mr. Chambers also delivered an interesting talk on "Fundamental Aspects of QC." Approximately 60 members and guests attended the meeting.

Seventeen ASQC members and local industry employees completed a course in elementary mathematical statistics at Kingsport, Tenn. The course was jointly sponsored by the section and the state and city education boards.

**NORTHEASTERN INDIANA** . . . Eugene V. Grumman, chief engineer, Bullard Co., Bridgeport, Conn., spoke on "Machine Capabilities," at a dinner meeting Nov. 19, at Hall's Guest House.

Mr. Grumman is widely known for his work in quality control, and has held many responsible positions in QC at the Bullard Co.

**OMAHA-LINCOLN** . . . The meeting was originally scheduled for Nov. 13, but the Nebraska weather chart went out of control, causing hazardous driving conditions. The weatherman was promptly informed of the out-of-control condition and corrective action was taken. The meeting was then rescheduled for Nov. 20. On that date 25 members and guests made the journey to Nebraska City, for dinner at Steinhart Park Lodge, followed by a tour of the American Meter Co. C. W. Lecure, chief inspector, demonstrated and explained American Meter's application of QC.

**PHILADELPHIA** . . . Attendance and advance registrations for the November meeting hit a high for the year. Seventy-two members and guests heard H. I. Lill, Jr., N. Y. Ship Corp., give an excellent talk and slide show on the building of the Nuclear Ship Savannah, with an explanation of the technical problems involved.

Technical sessions by Mr. Aubin, Underwood Corp., and Norman Miller, Frankford Arsenal, were both highly enlightening and well attended. Mr. Miller augmented his talk with a recent movie demonstrating how the pilot ejection system works with highspeed aircraft in flight.

**Norman Miller and H. I. Lill, Jr., spoke at the November meeting of the Philadelphia section.**

A. Mall of Frankford Arsenal, education committee chairman, organized the first workshop clinic Nov. 7. Despite rainy weather, 30 members came out to the Philadelphia Textile Institute to hear a panel of three QC authorities present short cuts in statistical methods. Peter Graziano, Temple University Evening Division, demonstrated a short cut for computing means and standard deviations of grouped data and the median of a sample as a quick approximation of the mean. Irwin Hoffer, Professor Emeritus of Temple University, presented Enoch Ferrell's mid-range technique for control charts and the statistical sign test. Stanley Wirtschafter, American Machine and Metals, Inc., demonstrated the quadrant sum test for approximating Spearman's rank correlation coefficient and a short cut for approximating standard deviation.


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# SECTION CALENDAR (JANUARY 25–FEBRUARY 29)

| SECTION | DATE | PLACE | TIME | SUBJECT | SPEAKER |
|---|---|---|---|---|---|
| Akron-Canton | Feb. 18 | Firestone Tire & Rubber Co. | 8:00 p.m. | Plant tour | ——— |
| Albuquerque | Feb. 9 | University of New Mexico | 7:00 | Repeatability of Gaging | Roy A. Wylie, Instrumentation Division, Ampex Corp., Redwood, Calif. |
| Allentown-Bethlehem | Feb. 10 | Hotel Traylor, Allentown, Pa. | 7:00 | Who Controls Quality and How? | Warren R. Purcell, Raytheon Co., Newton, Mass. |
| Baltimore | Feb. 16 | Baltimore Memorial Stadium | 8:45 | Quality Control in the Job Shop | Frank Caplan, Jr., Westinghouse Electric Corp., Blairsville, Pa. |
| Binghamton | Feb. 24 | Endicott E. J. Recreation Center | ——— | The Next 100 Years. Annual Technical and Engineering Council Dinner | Dr. Clifford C. Furnas, Chancellor of the University of Buffalo |
| Buffalo | Jan. 25 | University of Buffalo, Norton Hall | ——— | The Use and the Application of the New Mil-Std-414 | Elmer F. Collins, Jr., U.S. Navy Statistics Dept., Falls Church, Va. |
| | Feb. 1 | Boots and Saddle Restaurant, Niagara Falls, N. Y. | ——— | Response Surface Methodology. Joint Meeting with ASA | G. E. P. Box, University of Wisconsin, Madison, Wis. |
| Chicago | Feb. 17 | Furniture Club of America | 4:30 | General meeting | To be announced |
| | | | 6:30 | A Purchasing Agent's Viewpoint of QC | John Jasch, Victor Adding Machine Co. |
| Cleveland | Feb. 5 | Cleveland Engineering Center | 7:45 | Quality Control in Antarctica | Father Henry Birkenhauer, John Carroll University, Cleveland, Ohio |
| Cincinnati | Jan. 30 | Sinton Hotel, Cincinnati, Ohio | ——— | Ninth Annual All Day January Conference | ——— |
| | Feb. 17 | Engineering Society Building | 8:00 p.m. | Monte Carlo Applications | Winston C. Dalleck, Consultant, McKinsey & Co., Chicago, Ill. |
| | Feb. 29 | Engineering Society Building | 7:30 | Symposium—Statistical Methods in the Chemical Industry | Ralph A. Bradley, Florida State University |
| Columbus | Feb. 17 | Westinghouse Electric Corp. | 8:00 | Organization Quality | Harry Smith, Jr., Proctor & Gamble Co.<br>W. E. Barker, Jet Engine Dept., General Electric Co., Cincinnati, Ohio |
| Corning-Elmira | Feb. 9 | Corning, N. Y. | 7:00 | Ladies Night, Activities of Consumer Research | F. J. Schlink, president, Consumers Union |
| Delaware | Feb. 4 | Lord de la Warr Hotel | 7:00 | Applications of Industrial Statistics in Research and Development | Charles A. Bicking, The Carborundum Co., Niagara Falls, N. Y. |
| Evansville-Owensboro | Feb. 16 | Shady Rest Restaurant, Owensboro | 6:30 | Work Sampling | L. J. Smith, Mead Johnson & Co., Evansville, Ind. |
| Hamilton | Feb. 11 | Westinghouse Auditorium | 8:00 | Operations Research | P. J. Robinson, Imperial Oil Co. |
| Grand Rapids | Feb. 8 | ——— | ——— | Joint Meeting with ASTE | ——— |
| Hamilton-Middletown | Feb. 10 | Plaza Motel, Hamilton, Ohio | 6:30 | The Road Ahead for Quality Control | A. V. Feigenbaum, General Electric Co., N. Y. |
| Harrisburg | Feb. 3 | Yorktowne Hotel, York, Pa. | 6:30 | Buzz Session—The Quality of Inspection | J. T. Skelton, Caterpillar Tractor Co., York, Pa. |
| Hartford | Feb. 16 | Nutmegger House | 6:30 | Flatness, Straightness, Roundness and Surface Finish | Eric J. Schneider |
| Huntsville | Feb. 25 | ——— | ——— | ——— | Robert M. Laforge, University of Tennessee |
| Indianapolis | Feb. 1 | World War Memorial | 7:30 | General committee meeting | ——— |
| | Feb. 24 | Butler University, Administration Bldg., Rm. 131 | 7:30 | Some Economic Considerations of Inefficient Statistics | Gayle W. McElrath, University of Minnesota, Minneapolis |
| Lexington | Feb. 18 | Lexington Signal Depot | 7:00 | To be announced | ——— |
| Lima | Feb. 2 | Executive Committee meeting | ——— | ——— | ——— |
| | Feb. 9 | Regular meeting | ——— | ——— | ——— |
| Los Angeles | Feb. 24 | Statler Hotel | ——— | One Day Reliability Symposium | ——— |
| Louisville | Feb. 8 | Jimmy Lynn's Restaurant | ——— | Statistical QC in Operation Research | Carl Noble, Kimberly-Clark Corp., Neenah, Wis. |
| Metropolitan | Feb. 26-27 | Hotel Statler, New York City | ——— | Metropolitan Conference on Quality Control | ——— |
| Montreal | Feb. 17 | C.I.L. Bldg. | 8:15 | Interesting Plant Personnel in QC | J. F. Verigan, Ormet Corp., Hannibal, Ohio |
| Northeast Tennessee | Feb. 9 | General Shelby Hotel, Bristol, Tenn. | 8:00 | Management of Statistical Functions in Industry | A. F. Johnson, Buckeye Cellulose Corp., Memphis, Tenn. |
| Omaha-Lincoln | Feb. 15 | Cushman Motor Co., Lincoln | 7:00 | Joint meeting with Cushman Industrial Club | ——— |
| Pensacola-Mobile | Feb. 16 | Martines, Pensacola, Fla. | 7:00 | Beta Ray Profiles in QC | L. S. Trahan, Internat'l Paper Co., Mobile |
| Philadelphia | Feb. 18 | Germantown Cricket Club | 6:15 | Quality—The Consumer's View of It | Sidney E. Longmaid, Esterbrook Pen Co., Camden |
| Rhode Island | Feb. 18 | Providence Engineering Building | 8:00 | Short-cut Statistical Methods as Applied to Reliability | Gordon H. Beckhart, RCA, Camden, N. J. |
| San Antonio | Jan. 27 | Hilton Hotel | 8:00 | A Quality Audit Program | J. A. Fournier, Ford Motor Co., Dearborn, Mich. |
| | Feb. 20 | ——— | ——— | All Day Symposium | ——— |
| San Diego | Feb. 8 | Lafayette Hotel | 6:00 | QC Responsibility for Production Tests, Tools and Limited Production | I. Dagan, Rohr Aircraft, San Diego |
| St. Charles | Feb. 16 | General Electric Co., DeKalb | 3:30 | Plant tour. Some New Ideas in QC | David Fyffe, General Electric Co., DeKalb, Ill. |
| St. Louis | Feb. 13 | Golden Fried Chicken Loaf Restaurant | 7:30 | Valentine Party | ——— |
| Seattle | Feb. 9 | Benjamin Franklin Hotel | 7:30 | ——— | ——— |
| Syracuse | Jan. 26 | Turn Hall | 7:00 | Process Capability Studies in the Pharmaceutical Industry | Klare L. Teegarden, Bristol Labs., Inc., Syracuse |
| South Texas | Jan. 29 | Houston Engineering Society | ——— | A Quality Audit Program | J. A. Fournier, Ford Motor Co., Dearborn, Mich. |
| Southern Connecticut | Feb. 17 | ——— | 6:00 | Ladies' Night Program | Miss Bonnie Small, Western Electric Co., Allentown, Pa. |
| Toledo | Feb. 4 | Electric Auto Lite Co., Fostoria, Ohio | 6:30 | Plant tour. QC in the Spark Plug Industry | Fred Reardon and Clifford Veite |
| Toronto | Feb. 3 | University of Toronto, Elec. Bldg. | 7:30 | Vendor Relations | F. Caplan, Jr., Westinghouse Electric Corp., Blairsville, Pa. |
| | Feb. 16 | CGE Auditorium | 7:30 | Day to Day Inspection Problems | R. Cardno, Canadian GE, Toronto, Ont. |
| University of Western Ontario | Feb. 10 | Dominion Electrohome Ind., Ltd., Kitchener, Ont. | 8:00 | QC from a Sales Point of View | Russell Nickson, Royal Metal Mfgr. Co., Galt, Ont. |
| | Feb. 18 | Hooks Restaurant, London, Ont. | 7:00 | Management Views Quality Control | Lloyd Lansing, Eaton Automobile Ltd., London, Ont. |
| Washington, D. C. | Feb. 17 | Rich's | ——— | Sampling Techniues in Accounting and Auditing | John Neter, University of Minnesota, Minneapolis |
| Western Mass. | Feb. 9 | Shelton Hotel, Springfield, Mass. | 6:30 | Art Can Become a Science | F. C. Hartwell, Schweitzer Division, Kimberly-Clark Corp. |
| Worcester | Feb. 18 | Worcester Polytechnic Institute | 7:00 | QC and Industrial Engineering. Joint meeting with AIIE | Arnold O. Putnam, Rath and Strong, Boston, Mass. |
| Youngstown | Feb. 4 | Warren Hotel | 6:30 | Reliability in Engineering | C. V. Crockett, GMC Truck and Coach Division |

**PARKERSBURG** . . . The February meeting will be held the last week in the month at the Chancellor Hotel. A display of calculating equipment will be sponsored by local industries.

On Nov. 30, an executive meeting was held at the Howard Johnson Restaurant.

The November meeting was a tour of the Union Insulating plant. About 40 members and guests enjoyed a very interesting evening. Our anticipation is that we may be welcome again at an early date.

**PENSACOLA-MOBILE** . . . A Texan, Buford M. Appleman, Texas Foundries, Lufkin, Tex., was the guest speaker at the November meeting. As conspicuous as the absence of cranberries from the menu was the way the membership enjoyed our speaker's presentation describing the method employed at Texas Foundries for reducing scrap. The method was described as management by exception—by the use of statistical analysis, trouble areas are located and the causes identified and eliminated. This method, employed by Texas Foundries, is resulting in large savings in scrap costs.

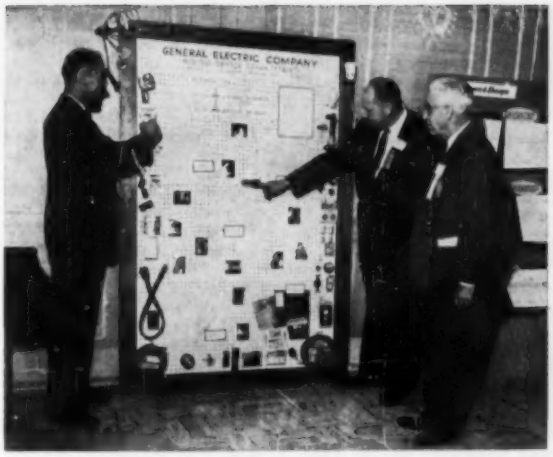
Mr. Appleman is currently sales service manager for Texas Foundries. He is a member of the American Foundrymen's Association, vice chairman of the South Texas section, ASQC, and the Steel Founder's Society of America and the Society for Non-Destructive Testing.

Our February speaker is L. S. Trahan, section treasurer. His subject will be "Beta Ray Profiles in QC."

**PORTLAND** . . . Roy Fink, supervisor of metallurgy, Esco Electric Steel Foundry Co., gave an excellent illustrated talk on 'Statistical Metallurgy," at the meeting Dec. 1, at the Public Service Building. The January meeting will be a joint dinner meeting with the Purchasing Agent's Association. All members are urged to bring a friend.

**RHODE ISLAND** . . . A capacity turnout of 250 persons attended our section meeting Nov. 19. G. G. Parkin, Minnesota Mining and Manufacturing Co., spoke on "Sales Forecasting as Quality Control."

The Rhode Island section was host to the 13th New England Conference, Sheraton Biltmore Hotel, Providence, R. I., Nov. 4-6. Conference chairman was Al Cummings, Browne & Sharpe.




Rhode Island section officers view one of the displays at the 13th New England Conference in Providence, R. I. Shaw Goldthwait, right, section chairman, watches as Fred W. Kolling, center, section vice chairman and conference display chairman, pushes the ASQC button to ring a buzzer. Robert Rumazza, left, QC engineer, General Electric Co., explains the Wiring Device Department product line.

**SAN ANTONIO** . . . James R. Crawford, ASQC Fellow associated with operations and research for Lockheed Aircraft Corp., Burbank, Calif., spoke on "The Case of Percentage Sampling," at the Nov. 24 meeting. This paper included the direct results of multi-level continuous sampling and a related subject, the power of sampling plans. Mr. Crawford's paper was well received judging by the question and answer period that followed his talk.

E. W. Doiron, general chairman of our one day symposium, Feb. 20, announced that committees are completing details

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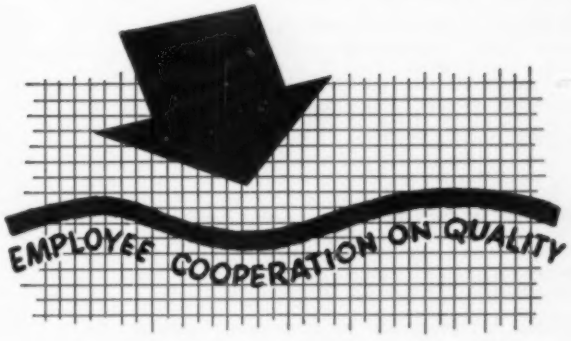


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**SAN DIEGO** . . . The December meeting of the executive board was held in the home of Lon Franklin. Decision has been made to continue holding the executive board meetings in the homes of board members.

The November meeting, sponsored by A. S. Billings, Ryan Aeronautical, went over with a bang. The subject, "Reliability Approaches," drew controversial discussions which are always interesting to say the least. Attendance at this meeting is a mark to remember—190 Senors y Senoritas.

The meeting Feb. 8, moderated by I. Dagan, Rohr Aircraft, should give an inside track on QC's Responsibility for Pre-Production Tests.

Pasen un ano nuevo muy Felice, prospero y accompaniados de Dios. ¡Adios Amigos!

**ST. CHARLES** . . . Due to the steel strike, we were forced to change our program scheduled for Nov. 27, from a plant tour of the DeKalb, Ill., General Electric Co. plant, to a talk by Cliff Williams, Zenith Radio Corp., on "Incentive Plans and Quality," at the Club Arcada, St. Charles.

Mr. Williams proposed the idea that a well developed incentive plan is a definite asset to a QC program. A lively discussion period followed his talk. This topic was originally scheduled for the February program. Our thanks to Cliff for a thought provoking topic well prepared on short notice.

The pre-dinner seminar on "Economic Factors in Choosing AQL's," was presented by Bob Fisher of General Electric Co.

We are looking forward with renewed anticipation to the GE plant tour now scheduled for Feb. 16, which will be followed by the usual dinner meeting.

**ST. LOUIS** . . . Section membership has increased this year to 172—this is a 20 percent increase over last year. Along with greater membership, top-flight speakers and the efforts of the publicity committee have brought about increased attendance at each successive section meeting. In November we had a total of 60 present. This includes 18 of the students enrolled in the several statistical QC courses being presented by the section.

Activities of the Southern Illinois sub-section continue to grow. The section, in conjunction with Southern Illinois University, is about to complete a course in basic QC.

**SEATTLE** . . . Nov. 10, the section met at the Benjamin Franklin hotel. Berl Owens, engineering department, University of Washington, discussed recent developments in time study procedures using sampling methods as compared to clerical methods.

**SOUTH TEXAS** . . . Preceeding the dinner at 7:30 p.m., Jan. 29, at the Houston Engineering and Scientific Society, there will be a training session from 6:15 to 7:15 p.m. Past experience has shown that the educational benefits of these sessions, which feature local people, have been widely accepted by the section's membership.

**SOUTHERN CONNECTICUT** . . . A gaging seminar presented by F. W. Blanchette and three of his sales engineers Nov. 18, was attended by more than 80 members and their guests from other interested fields. The emphasis was on principles and applications of air-gaging techniques.

One of the highlights of this year's program will be a Ladies' Nite dinner meeting on Feb. 17, when members and their wives will be addressed by Miss Bonnie B. Small, department chief in engineering, Western Electric Co.

**SYRACUSE** . . . There will be no February meeting. Instead, we urge you to attend the engineering symposium offered by the Technical Societies' Council Feb. 27.

Among the lecturers will be James L. Coburn, Convair-General Dynamics Corp., Fort Worth, Tex. Mr. Coburn will speak on "Effective Failure Reporting, Feedback, and Corrective Action," a subject particularly slanted to be of interest to QC people. The program which is being arranged by O. William Irving, Electric Auto-Lite Co., one of our ASQC members, should prove to be of interest.

It has been agreed that the joint meeting with the Standards Engineers' Society will become an annual event.

**TOLEDO** . . . J. H. Molnar, Houdaille Industries, Detroit, Mich., spoke at the November meeting. Clarence Burdick, who was originally scheduled as speaker, has been transferred and promoted to assistant manager, Huntington Division, Houdaille Industries. Mr. Molnar is filling the position vacated by Mr. Burdick, and also did a nice job of filling his speaking engagement with our section.

The February meeting will be a plant tour of the Spark Plug Division of Electric Auto Lite, Fostoria, Ohio. Fred Reardon, a longtime and very active and faithful member, together with Clifford Velte, will be hosts to the section. We anticipate an exceptionally interesting evening, as a similar trip a few years ago proved to be a memorable occasion.

**TORONTO** . . . Irwin de Grote, Ford Motor Co., Dearborn, Mich., had a good attendance for his interesting lecture on Nov. 4. He considered "Machine and Process Capabilities" in detail, and everyone enjoyed the discussion session.

Twenty-five persons attended the first of this section's study groups, and although such an attendance had not been anticipated, the meeting did not become at all unwieldy under the able chairmanship of our own Cliff Hilditch. Although this was in the nature of an experiment, it is generally felt that the whole thing was an unqualified success and we are eagerly looking forward to our next one.

**TUCSON** . . . The November meeting was prefaced by a clinic on "Test Strips," conducted by Harvey J. Nelson, process engineering, Hughes Aircraft Co. Bernard L. Garmire, Tucson chief of police, furnished considerable insight on the subject of "Quality of Law Enforcement." Improved methods of selecting prospective police officers was mentioned as the most important technique.

**UNIVERSITY OF WESTERN ONTARIO** . . . James Scranton spoke on "IBM in Relation to QC," at the meeting Nov. 18, at the General Motors Corp., Diesel Locomotive Plant, London, Ont. Mr. Scranton explained the methods used in the QC function up to and during the introduction of accounting machines. A plant tour by 63 members and guests was followed by coffee and doughnuts.

The Hamilton Forum was held at McMaster University Nov. 14. It was sponsored by the Hamilton, University of Western Ontario and the St. Catharines sections.

**UTICA** . . . Richard S. Bingham, Jr., was guest of honor at our Nov. 17 meeting. He spoke on "The Modern Uses of the Range." Judging from the spontaneous questions that arose throughout his talk, the group was quite stimulated.

H. L. Berke, General Electric Co., spoke on "Test Equipment Correlation Capability Program." This proved to be very interesting and informative.

**WASHINGTON, D. C.** . . . The November cocktail-dinner meeting at Rich's was well attended, although apparently a few softies balked at the early subfreezing D. C. weather. William W. Wolman, Bureau of Yards and Docks, Naval Department, spoke on "Sampling Inspection by Variables, with Special Reference to Military Standard 414." Mr. Wolman explained that M.S. 414 was developed at Stanford University, but that he wrote it with Harry Rosenblatt for the Department of Defense. Following the address, many availed themselves of the opportunity to hear the answers to their questions from a direct source.

**WESTERN MASSACHUSETTS** . . . The New England Conference was held at Providence, R. I., Nov. 4-6. To encourage attendance, there was no monthly meeting. Our William Carter gave the opening address.

The intermediate course in industrial statistics is planned to start Feb. 1, in conjunction with the Massachusetts University Extension, for a 12 week term. The text will be "**Introduction to Statistical Analysis**" by Dixon and Massey.

**WORCESTER** . . . On Nov. 19, Welton Parker, Rockbestos Corp., New Haven, Conn., described some very useful QC tools and discussed their application in an industry that has a relatively small number of component types but a large variety of materials and combinations of components. Mr. Parker also showed several samples of the different types of insulated wire and cable produced by his company as well as charts and diagrams of the various QC tools discussed. Mr. Parker is affiliated with the New Haven section.

The business meeting and guest speaker were preceded by an excellent dinner at the dining hall of Worcester Polytechnic Institute.

Feb. 18, the section will hold a joint meeting with the local section of the American Institute of Industrial Engineers. The speaker will be Arnold O. Putnam, Rath and Strong, Management Consultants, Boston, Mass. This meeting should be of great interest to people interested in both QC and industrial engineering fields. Mr. Putnam is currently director of research at Rath and Strong, and his experience has included many assignments in QC, statistical engineering, work measurement, wage incentives, and many others.

**YOUNGSTOWN** . . . Our meetings, scheduled as they are on the first Thursday of every month, puts our staff in a bind to maintain current news. Our November meeting was quite outstanding, with Frank Caplan Jr., Westinghouse Electric Corp., as our main speaker. Mr. Caplan discussed

process control and how it could improve production without punishing the operator. Psychology, as well as quality control, becomes necessary in order to obtain this goal. Full cooperation between operator, foreman, inspector, supervisor and management is a must before quality control can function properly. One of the highlights of the evening was the presence of Mrs. Caplan, the speaker's wife, whose charm has won many friends. Approximately 80 members and guests were present.

Our January meeting will feature John W. W. Sullivan, American Iron and Steel Institute.

## SIGNIFICANT DIFFERENCES

. . . Allentown-Bethlehem—Thanks to our energetic membership chairman, we're happy to report that our section ranks first in the Fifth District (as of Oct. 31) with 109.4 percent of last year's membership.

As another significant difference, 36 different companies are represented in our membership!

. . . Baltimore—**John F. Hird**, formerly with the Standard Fruit and Steamship Co., recently accepted a QC engineering position with Western Electric Co., Baltimore, Md.

**John D. Pryor**, formerly with the Catalyst Research Corp., recently accepted a QC engineering position with Western Electric Co.

. . . Binghamton—We are happy to welcome five new members into our midst: **George W. Allen**, QC manager, IBM, Endicott; **Stephen W. Martinkovic**, assistant quality manager, Cadre Industries; **Leland W. Van Dozer, Jr.**, quality manager, Mer. Lit. Fabricating Corp.; **Donald W. Sturdevant**, QC technician, IBM, Endicott, N. Y., and **Vincent G. Vance**, IBM, Owego, N. Y.

**Robert J. Haskins**, quality engineer, IBM, Endicott, has been promoted to associate engineer.

. . . Boston—**Charles Willis** has moved to Raytheon's Semiconductor Division. He will supervise QC activity of incoming inspection. Vendor relations will be his "hobby" from now on.

**B. P. Goldsmith** has left the Raytheon Co., and accepted a position as assistant professor at Northeastern University. He will continue to teach in Northeastern's QC Institute, and will also participate in the new Management Center Program.

. . . Buffalo-Niagara Falls—**Arthur Stein** has been appointed to act as the liaison representative to the Traffic Safety Advisory Committee by **Norman C. Hodge**, Buffalo ASQC section chairman. Mr. Stein resides at 2402 Kensington Ave., Snyder 21, N. Y., and is employed by Cornell Aeronautical Laboratory, Inc., 4455 Genessee St., Cheektowaga, N. Y.

. . . Cleveland—Congratulations are in order for **Ed Flynn**, formerly of American Greetings, who has accepted a position with a West Coast Greeting Card manufacturer. We are all sorry to see Ed leave. Good Luck, Ed!

**Steve Bates**, national director, has been vacationing in Bermuda. We are looking forward to seeing his slides upon his return.

. . . Cincinnati—**R. K. Johnson** has been appointed by J. **Mark Hiebert**, president of the Sterling Drug Co., to represent the Hilton-Davis Chemical Division on the Sterling Drug quality control committee.

. . . Corning-Elmira—**John S. Gailey**, QC engineer, Corning Glass Works, has been transferred to "B and C" factory in Corning, N. Y.

**Larry Lalor**, treasurer of the Corning-Elmira section, was promoted to QC supervisor at the Corning Glass Works plant in Big Flats, New York. Mr. Lalor was formerly QC engineer at the Corning Glass Works "B & C" factory.

**W. H. Crompton**, formerly QC supervisor, has been promoted to process and equipment engineering supervisor at the Corning Glass Works Big Flats plant.

. . . Dallas-Fort Worth—**Raymond L. Gallahue, Jr.**, has accepted a position as production manager for Maxwell Electronics, Garland, Texas. **Wm. E. Smith**, Chance Vought Aircraft, Inc., has been selected to complete the term of director which was made vacant when **Robert P. Boché** moved to Cincinnati.

. . . Delaware—**Larry Steinhauer** has been promoted to senior production supervisor of the Industrial Products Division, International Latex Corp.

. . . Greater Detroit—**Edward R. Clark**, past chairman of the Greater Detroit section, has been named supervisor of reliability engineering at the Detroit Transmission Division, General Motors Corp.

**Clarence Burdick** has left the section to assume the responsibilities of his new position as assistant manager of the **Huntington** Division of Houdaille Industries Inc., Huntington, W. Va.

**Joseph Molnar** has been elevated to the position of manager of quality control for Houdaille Industries, Inc.

. . . Georgia—**William G. Gage, Jr.**, is now with Lockheed Aircraft Corp., and living at 106 Norton Circle, Smyrna, Ga.

. . . Greater Muskegon—**Paul Bergman**, Johnson Products, Muskego, has been appointed to the board to replace **Ray Porter** of Muskegon Piston Ring, who has been transferred to Detroit.

. . . Hamilton-Middletown—**William P. Sommers**, controls development unit, Champion Paper & Fibre Co., has been transferred to Champion Specialties Inc., Piqua, Ohio. He will assume the postion of assistant to the production manager.

. . . Harrisburg—The Harrisburg section has attempted, and found successful, something new for dinner meetings. This is the elimination of the officers and speakers table. This has allowed the officers and visiting speakers an opportunity to associate more closely with the members and has produced a more friendly attitude throughout the membership.

. . . Indianapolis—**Caryl Cook**, senior member, has retired as chief inspector at Thomas & Skinner Corp., producers of quality magnetic materials and devices.

New area delegates: Kokomo—**Bill Adams**, Haynes Stellite Co., and Columbus—**"Mac" Broach**, Arvin Industries.

**John T. Craig** has been named chief chemist of the Terre Haute, Ind., plant of the commercial solvents Corp.

. . . Joplin—**Bill Phillips** has taken over **Jim Brewer's** duties as Sandia Corporation resident inspector at Eagle-Picher Plant, Joplin, Mo.

. . . Kansas City—**V. J. Smeltzer**, Kansas City Division of the Bendix Axiation Corp., has been appointed manager of inspection.

. . . Lexington—Section members are sporting three inch plastic name badges which display the society emblem and identify the member with the society, his section and his business affiliation. For guests, we have a pink card which shows his name when worn in a breast pocket. This card requests pertinent membership information and the guest is asked to fill out the card and turn it in to the membership chairman at the close of the meeting.

## RELIABILITY TRAINING COURSE

**Sponsored by IRE (PGRQC) and ASQC (Electronic Division)**

**Sessions are being planned for 1960 in the following areas: Boston, Mass., February; St. Petersburg, Fla., March; St. Paul, Minn., April; Dallas-Fort Worth, Tex., May.**

Those persons with responsibility for company reliability programs are invited to participate in these courses which will cover the key areas of reliability as they affect each of the stages of design and development, manufacture, test and field evaluation. Each course will present by means of lectures and discussion groups the combination of engineering, statistical and management techniques vital to an effective reliability program. Extensive text and case histories material will be furnished to aid in understanding application of the principles.

**They will be one week residence courses. The fee of approximately $225 includes tuition, course materials, room and three meals. To assist in planning please advise immediately of your interest, probability of attendance and location of the course you would like to attend. Send card or letter to H. N. Hadley, reliability and components analysis section, Sylvania Data Systems Operations, 189 B St., Needham 94, Mass.**

**In advance of course specified you will receive a brochure giving details and an application form.**

. . . Lima—Chalk up promotions for Lima section members **Richard Peggs, James Micheli, James Fess** and **John Jolliff**, all of Ford Motor Co. Mr. Peggs is now QC technician in methods analysis. Mr. Micheli is now QC technician in vendor liaison. Messers Fess and Jolliff have been promoted to statistical analysts.

. . . Los Angeles—**Pat J. Mallon,** Hughes Aircraft Co., was recently promoted to manager of operations, reliability and quality general office, replacing **John J. Tamson,** who moved to the Communications Division as manager of quality.

**John R. Shea,** Autonetics, North American Aviation, was recently appointed QC manager.

**Larry Clapham,** formerly quality engineer at McCulloch Motors, Los Angeles, Calif., is now a reliability engineer at Systems Technology Laboratories.

**Fred Burns,** Hughes Aircraft Co., formerly of Westinghouse Electric Corp., was recently named as quality manager of the El Segundo Division.

**Paul K. Leatherman,** formerly with the Chrysler Corp., St. Louis, Mo., is now a chemical engineer with the quality assurance division of the Headquarters AMC, Ballistic Missiles Center, USAF, in Los Angeles, Calif.

**Denis Stone** of Topp Industries, U. S. Science Subsidiary, formerly chief of QC engineering, has recently been named QC manager.

**Al Candelaria,** formerly of Hughes Aircraft Co., ground system group, is now head of quality engineering at Epsco West, Anaheim, Calif.

**Nelson Miller,** Inet Division, Leach Controls, has recently been promoted from inspection foreman to chief inspector for the division.

**Keith Pilger,** Hughes Aircraft Co., has joined the reliability and quality general office as a staff engineer.

**John C. Morey** has been appointed manager of quality assurance for the ground systems group of the Hughes Aircraft Co. Morey was formerly chief of quality and reliability at the Hughes El Segundo manufacturing plant, and previously served as a staff engineer on quality and reliability in the company's general offices.

. . . Milwaukee—**William A. Golomski** has been appointed general sales manager, H. J. Mayer & Sons Co., Inc., 6811 S. Ashland Ave., Chicago 36, Ill. Most recently he has acted as independent consultant to process industries, and served as director, operations research, Oscar Mayer & Co., Madison, Wis.

**Robert T. Miller** has transferred to the Milwaukee section from Cleveland. Mr. Miller, who is now with Ray-O-Vac Co., Madison, Wis., was previously associated with the P. R. Mallory Co.

. . . Montreal—**George Williams** is now with TCA.

. . . South Texas—**G. E. Nevill,** education chairman, has recently been promoted to engineer of standards with Cameron Iron Works, Inc., Houston, Tex.

. . . Southern Connecticut—**Howard F. Burbank,** formerly of Stratford, is now associated with Litton Industries in Bethesda, Md.

Our reporter, **Robert E. Kleid,** is now associated with Sperry Semiconductor Division of Sperry Rand Corp., South Norwalk, Conn.

. . . Northeast Tennessee—**Joseph A. Koch,** Chrysler Corp., QC representative to Sperry Farragut, Bristol, Tenn., has been transferred to Chrysler's Detroit plant. Mr. Koch has been promoted to supervisor of sub-contracts group in Chrysler's Guidance and Control Systems Division.

**Stanley Murrey,** Tenessee Eastman, has been promoted to senior chemical engineer of quality control in the acids division.

. . . Pensacola-Mobile—**D. H. Dannheisser** will represent the section at the first planning meeting of the 1960 QC conference, to be held at the University of Alabama.

. . . St. Charles—**Ted White** is leaving the DeKalb, Ill., plant of General Electric Co., for a position with GE's New York office of Quality Control Services. We certainly regret having Ted leave our group as he was very active in the section, was a past chairman, and was instrumental in obtaining our section status. Our congratulations to Ted, however, on his promotion and certainly our best wishes go with him.

. . . Western Massachusetts—This section is a member of the Valley Council of Technical Societies, which is a group of all the technical societies in the Springfield, Mass., area. The Council meets monthly for the purpose of fostering the recognition of the various member groups, counselling and sponsoring joint activities. **John Aldrich,** Tecifax Co., Holyoke, Mass., is our representative. He is also secretary of the Council.

. . . Worcester—**Thomas Lovett,** a former member of the Worcester section, has been transferred to the Hartford Division of U. S. Envelop Co. He was formerly with the Whitcomb Division in Worcester, Mass.

The section has been sponsoring a course in "Thinking Tools for Industry and the Engineer," at the Worcester Polytechnic Institute. This course is given two hours a week for ten weeks by Len Seder and Dorian Shainin.

# clinics, conferences, and courses

## JANUARY

. . . ***29-30—Evolutionary Operation course sponsored by the Chemical Division at the Hotel Cambridge, Mass., contact Miss Francis Herman, 19 Edgehill Road, Brookline 46, Mass. Instructors will be J. Stuart Hunter, U.S. Army Mathematics Research Center, University of Wisconsin, Madison, Wis., and Truman L. Koehler, American Cyanamid Co.***

. . . ***30—Ninth Annual All Day January Conference, Sinton Hotel, Cincinnati, Ohio, sponsored by the Cincinnati section, ASQC.***

## FEBRUARY

. . . *1-11*—The thirteenth annual short course in QC by Statistical Methods, Mechanical Engineering Dept., University of Illinois, with the cooperation of the Division of Engineering Extension at Urbana, contact Robert K. Newton, supervisor, Engineering Extension, 116 D Illini Hall, Champaign, Ill.

. . . ***2—One Day Clinic, sponsored by the Portland section, Anchorage Restaurant, Portland, Oregon, contact Henry Blood, clinic chairman, Omark Industries, Inc., 9701 S. E. McLaughlin Blvd., Portland, Oregon.***

. . . ***11—ASQC Third Automotive Division All Day Conference at the Rackham Bldg., University of Michigan, Ann Arbor, Mich., contact Joseph Molnar, general chairman, QC manager, Houdaille Industries, Inc., 2660 E. Grand Blvd., Detroit 11, Mich.***

. . . *5-6*—Industrial Management Engineering Conference with a section in QC, contact LeRoy A. Wickstrom, conference director, Department of Industrial Engineering, Illinois Institute of Technology, Chicago 16, Ill.

. . . ***18-19—Tenth Annual Textile Division Conference, Clemson House Hotel, Clemson, S. C., contact Robert E. Heiland, Rt. 1, Coopersburg, Pa.***

. . . ***20—All Day Symposium sponsored by the San Antonio section, ASQC.***

. . . ***24—One Day Reliability Symposium, Hotel Statler, N. Y. City, sponsored by the Los Angeles section, ASQC.***

. . . ***26-27—Metropolitan Conference on QC, Hotel Statler, N. Y. City, sponsored by the Metropolitan section, ASQC, contact Edwin Shecter, Sonotone Corp., Box 200, Elmsford, N. Y.***

. . . ***29—Symposium—Statistical Methods in the Chemical Industry, Engineering Society Bldg., Cincinnati, sponsored by the Cincinnati section, ASQC.***

## MARCH

. . . ***5—Fourth Dayton Quality Control Conference, Biltmore Hotel, Dayton, Ohio, sponsored by the Dayton section, contact George A. Friesell, Dayton Air Force Depot (MDQ), Dayton 20, Ohio.***

## APRIL

. . . ***2—Fifth District All Day Conference, Hotel Yorktowne, York, Pa., sponsored by the Harrisburg, Pa., section, ASQC.***

. . . ***18-19***—Third Annual Conference on Automatic Techniques, sponsored jointly by ASME, IRE, and AIEE, at the Cleveland-Sheraton Hotel, Cleveland, Ohio, contact the Publicity Chairman, Room 530, 1213 W. 3rd St., Cleveland 13, Ohio.

## MAY

. . . ***24-26—14th Annual Convention and Exhibition of the American Society for Quality Control, Hotel Sheraton-Palace, San Francisco, Calif.***

. . . ***30-31, June 1—Mid-Pacific Conference, Honolulu.***

# ASQC Announces

## Advancements and New Members

### ADMISSIONS TO THE GRADE OF MEMBER
**(as of October 31, 1959)**

ABBOTT, WILLIAM H., Palo Alto, Cal.
ACETO, LOUIS A., New Haven, Conn.
AMOS, PAUL L., Richmond, Ind.
ACKER, JULIUS JR., Dallas, Tex.
AIKIN, RICHARD L., South Bend, Ind.
APPLEGRAD, AARON, Brooklyn, N. Y.
BAGGETT, BILLY M., Ft. Worth, Tex.
BARRON, DORSEY R., Racine, Wis.
BAVER, DAVID A., Hamburg, Pa.
BECK, EDWARD L., Bristol, Tenn.
BELCHER, MELVIN D., Cincinnati, Ohio
BENNETT, GENE L. JR., Ann Arbor, Mich.
BERKHEIMER, HARRY R., San Bernardino, Cal.
BESCH, LEO J., Sharon, Pa.
BITEL, JOHN P., Plainville, Mass.
BLANK, HAROLD, Fushing, N. Y.
BOBCO, HARRY A., Warren, Ohio
BOONE, PAUL R., Anaheim, Cal.
BOSK, RAYMOND J., Wabash, Ind.
BRANSFIELD, EDWARD J., Scottsville, N. Y.
BRAUN, SAMUEL, San Diego, Cal.
BRENNAN, THOMAS K., Little Falls, N. Y.
BRENNER, CHARLES B., Willow Street, Pa.
BRIDEGAM, ROBERT D., Temple, Pa.
BROWER, WILLIAM L., Marcy, N. Y.
BROWN, BERTRAM C., Lindsay, Ont., Can.
BROWN, HAROLD E., Detroit, Mich.
BRUNOT, CLAUDE A., Saint Albans, W. Va.
CAFARO, JOHN A., Merchantville, N. J.
CALHOUN, STUART R., Montreal, Que., Canada
CAMPBELL, JOE O., Garland, Tex.
CAMPRIELLO, VICTOR, Schenectady, N. Y.
CANDIANI, RAMON BARRUETA, Mexico, D F, Mexico
CARPENTER, JAMES K., Hawthorne, Cal.
CASEY, WALTER P. JR., Lenox, Mass.
CHARTRAND, GILLES G., Montreal, Que.
CHASE, ROBERT W., Flint, Mich.
CHAVERS, H. PAUL, Richmond, Ind.
CHIMERS, VINCENT J., Rochester, N. Y.
CHRZANOWSKI, EDWARD M., Chicago, Ill.
CIUL, EDWARD R., Detroit, Mich.
CLARK, GERALD R., Jamestown, N. Y.
CLARK, JAMES C., Woodville, Ohio
CLARK, MERVIN W., Evanston, Ill.
CLAYTON, JAMES E., Robbinsdale, Minn.
CLEMENTS, WILLIAM J., No. Andover, Mass.
COATS, BYRON C., Albuquerque, N. M.
COLE, MANLEY W., Upland, Cal.
CONANT, PAUL L., Arlington, Tex.
CONGER, WILLIAM C., Torrance, Cal.
COSAN, KENNETH W., Tulsa, Okla.
CRAIG, OLIVER H., La Puente, Cal.
CRIGGER, RUBEN C., Grandview, Mo.
CROFT, JACK W., Whittier, Cal.
CUNLIFFE, THOMAS G., Stamford, Conn.
CYR, JOSEPH W., Pittsfield, Maine
DAVIS, CALVIN E., Minneapolis, Minn.
DE FELICE, ALBERT J., Yonkers, N. Y.
DEAN, ARTHUR, Montreal, Que., Canada
DORING, OTTO C., Middletown, Ohio
DORNEY, ANDREW W., Balimore, Md.
DU VERNAY, GILBERT, Allen Park, Mich.
DUNLAP, HAROLD D., Dover, Del.
ECKLER, GUY T., Highspire, Pa.
EKVALL, DONALD N., Oreland, Pa.
ELLIS, BILLY E., Dallas, Tex.
EMMONS, CLARENCE E., Richmond, Ind.
ENOCH, VERNIE G., Marion, Ill.
FISHER, LOUIS E., Evansville, Ind.
FISHER, RICHARD L. JR., Chattanooga, Tenn.
FLORAKAS, NICHOLAS E., Montreal, Que., Can.
FLUCK, ALBERT C., Reading, Pa.
FOOTE, ROBERT S., Richardson, Tex.
FORAN, JAMES V., Roslindale, Mass.
FORRESTER, ELIZABETH B., South Bend, Ind.
FOSTER, CLARENCE D., Sunnyvale, Cal.
FOWLER, ROY E., Bristol, Conn.
GARCIA, GILBERT, Santa Fe Springs, Cal.
GARROW, HARVEY J., San Mateo, Cal.
GASTLE, FRANKLIN T., Buffalo, N. Y.
GERTZ, RALPH H., Massapequa, L. I., N. Y.
GILL, JAMES JR., Tucson, Ariz.
GILLILAND, ROBERT D., Louisville, Ky.
GLOOR, ROBERT W., Windsor, Ont., Can.
GODIN, MARCEL P., Brockville, Ont., Canada
GOLDMAN, EDWARD A., Cleveland Hgts, Ohio
GOLDSTEIN, LOUIS E., Dallas, Tex.
GONZALEZ, OSCAR MEDINA, Mexico, D. F., Mexico
GORE, PAUL W., Marion, Ill.
GRAHAM, KEITH R., Brownsburg, Que., Canada
GRAY, EDWARD, Birmingham, Mich.
GRIDER, ERNEST E., Cumberland, R. I.
GROSS, DAVID J., Poughkeepsie, N. Y.
GUNDERSON, ARCHIE D., Inglewood, Cal.
GURDAK, EDMUND, Taunton, Mass.
GUY, CHARLES A., Niagara Falls, N. Y.
HAAG, DWIGHT W., Canoga Park, Cal.
HALL, ROBERT S., Pacific Palisades, Cal.
HANADA, AKIRA KITAJIMA, Tokushima, Japan
HARDER, HAROLD D., Loudonville, N. Y.
HARGER, ANDREW P., Middletown, Ohio
HARMON, GERALD A., Monrovia, Cal.
HASSELL, MANUEL H., Moore, Okla.
HAYES, FRANK L., Torrington, Conn.
HAYES, DONALD H., Birmingham, Mich.
HEIDEN, WALTER G. E., Milwaukee, Wis.
HEILER, DONALD N., Rochester, N. Y.
HELMS, DALE J., Muncie, Ind.
HERRELL, LAWSON B., Kansas City, Mo.
HIKES, STEWART V., Lancaster, Pa.
HOBBINS, JOSEPH N., College Park, Md.
HOGAN, PAUL J., Kettering, Ohio
HOLM, ALAN F., White Bear Lake, Minn.
HOLMS, WALTER I., Horseheads, N. Y.
HORSTMAN, GERALD E., Rochester, Ind.
HUBBARD, RUSSELL O., Kingsport, Tenn.
HUFFMAN, MARVIN R., South Charleston, W. Va.
IKEDA, KEIZO, Yokohama, Japan
IRELAND, JOHN E., Phoenix, Ariz.
JACKSON, LLOYD C., Raytown, Mo.
JACOBS, ROGER E., Ortonville, Mich.
JAMES, JOE C., Louisville, Ky.
JOE, MAIN S., Los Angeles, Cal.
JOHANNESEN, SVERRE, Albuquerque, N. M.
JOHNSON, ROBERT D., Glen Ellyn, Ill.
JOHNSON, WILLIAM J., Danvers, Mass.
JORDAN, EUGENE P., Pittsfield, Mass.
JOSEPH, RUSSELL M., Wilmington, Mass.
KEENAN, DANIEL, Valois, Que., Canada
KEGG, WENDELL D., Alliance, Ohio
KELLER, MARTIN J., Kingston, N. Y.
KELLEY, THOMAS N., Pittsburgh, Pa.
KELSEY, PETER G., Montreal, Que., Can.


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KITCHEN, GEORGE A., Rochester, N. Y.
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KOWALSKY, LORNE A., Tecumseh, Ont., Canada
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KUEMMLER, CLAUS P., Glendora, Cal.
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LEA, EUGENE D., Garland, Tex.
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LEVENTHAL, HOWARD L., Melrose Park, Ill.
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**Milwaukee 3, Wisconsin**

Att: Product Education Service, 160

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**(as of September 24, 1959)**

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BODEM, RAYMOND J., Minneapolis, Minn.
CALOYERAS, A., Athens, Greece
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COLE, HOWARD F., Connersville, Ind.
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*(Continued on page 40)*


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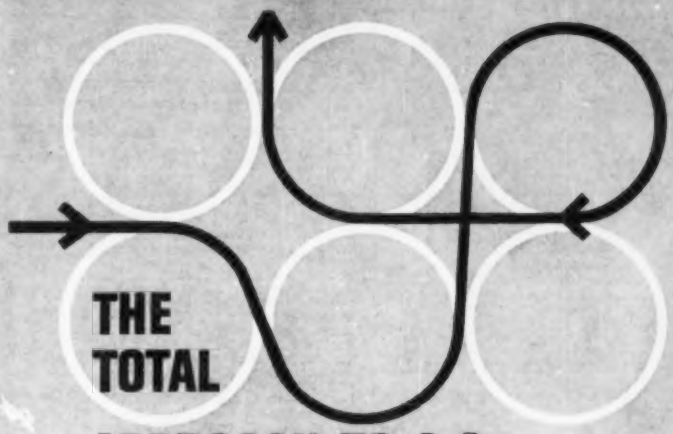

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# AND HOW IT WAS SOLVED

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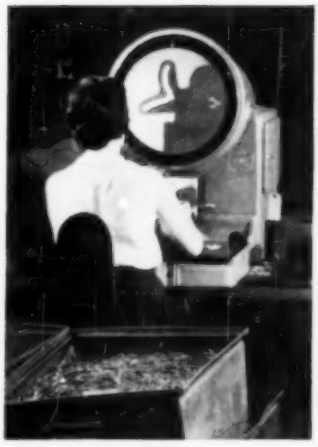

***Kodak Contour Projectors are distributed nationally by Optical Gaging Products, Inc.,** 26 Forbes Street, Rochester 11, N. Y.

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***the KODAK CONTOUR PROJECTOR***

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